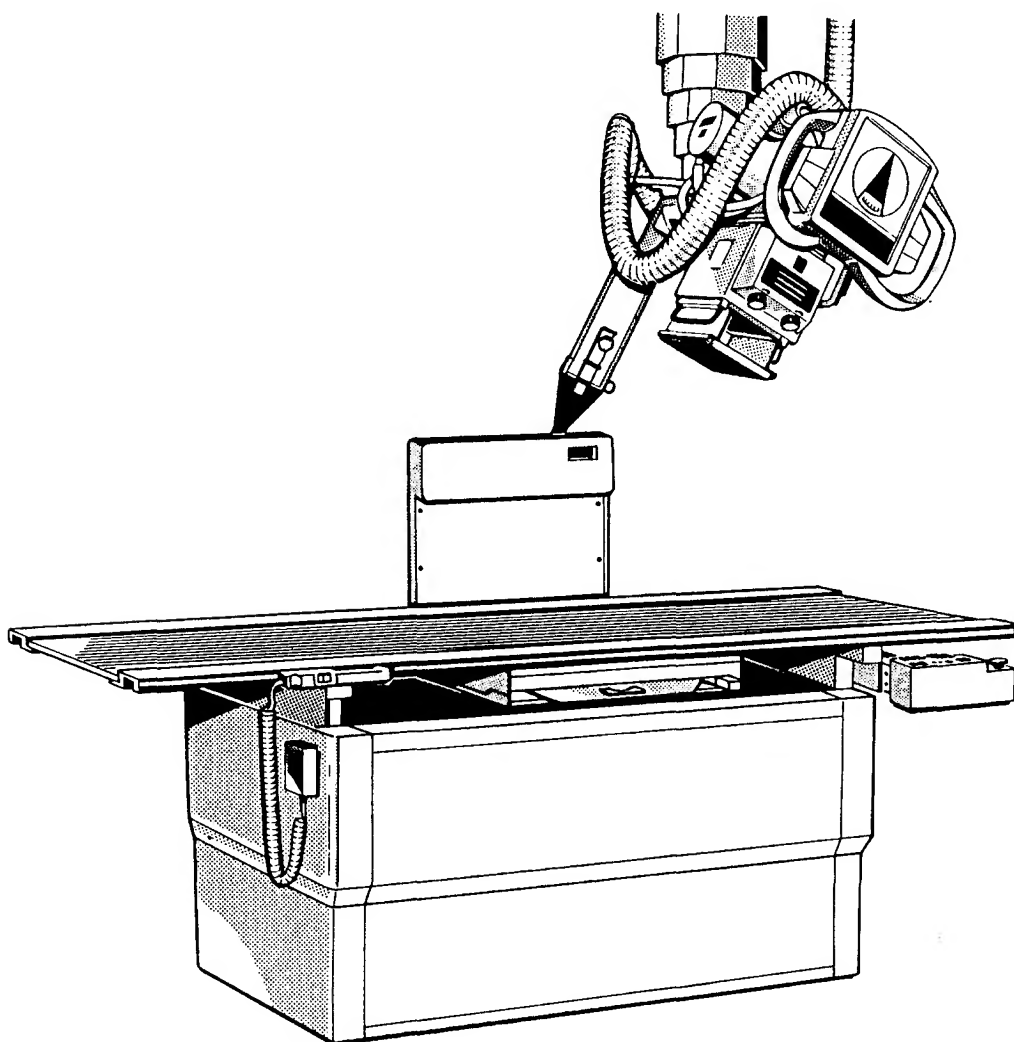


# Mounting instructions

ET 2000 TOMO Toshiba

---



	<b>PAGE</b>
<b>1. Technical Data</b>	
1.1 General Safety Procedures	3
1.2 General Specifications	3
1.3 Measures and Weights for Shipment	4
1.4 Component Designations	5
1.5 Equipment Checklist	6
1.6 Mains Connection Data	7
1.7 Measuring Instruments Required	7
1.8 Wiring and Current Diagrams	8-13
1.9 Power Supply	14
1.10 Physical Location of Electrical Components and Electric Field Installation Diagrams	14-19
<b>2. Installation</b>	
2.1 Uncrating	20
2.2 Removal of Covers	20
2.3 Mounting of Bracket	20
2.4 Mounting of Tomo Coupler	22
2.5 Mounting of Fulcrum Tower	22
2.6 Mounting of Tomo Control Box	22
2.7 Mounting of Tomo Drive on Ceiling Column	23
2.8 Mounting of Drive Belt to Ceiling Rail	23
2.9 Drive Belt tighten	23
2.10 Mounting of Tube Coupler	23
2.10a Modifikation on DST 100A Support Arm	24
2.11 Mounting of Tomo Interface	25
2.12 Installation of Electrical Unit	25
2.13 Installation of Relais Board to Ceiling	25
2.14 Installation of Tomo Marks	26
2.15 Reinstallation of Covers	26
2.16 Installation of Tomo Marks	27
2.17 Mounting of Covers	27
<b>3. Adjustments</b>	
3.1 Adjustment of Fulcrum to Film Plane	27
3.2 Setting of Layer Height	28
3.3 Timing of Exposure Cycles	29
3.4 Switch Flap Adjustment	30
<b>4. Technical Maintenance</b>	
4.1 Mechanical and Electrical Tests	31-32
4.2 Functional Tests	33
4.3 Spare Parts	34-36
4.4 Inspection Certification	27

## 1. TECHNICAL DATA

### 1.1 General Safety Notes

In the Federal Republik of Germany, the electrical installation of rooms used for medical purposes must conform to the provisions of VDE Standard 0107. Consult installation lay-out plan.

During installation it is important that all protective ground wire connections provided by the manufacturer are properly made before the equipment is started up.

The protective ground wires between the individual system components and the power supply are connected as shown in the wiring diagram.

Regulations of professional associations concerning safety and accident prevention must be observed.

No work may be performed on parts carrying a voltage higher than 42 V (Peak Voltage).

If it is necessary to turn on the power for execution of movements of the equipment in the course of the installation procedure, it must be shut down immediately after completion of these movements.

### 1.2 General Specifications

#### **Note:**

The motor driven ET 2000-Tomo device allows tomographic exposures with the DST 100A.

If supplied with the ET 2000, several parts are pre-installed.

Film-Focus Distance (FFD) for tomographic exposures:	100 cm
Fulcrum Range:	0 - 24 cm, motor driven
Plane Height Indication:	Digital Display
Angles, Tomography:	40° and 20° Zonography: 8°
Speeds, Tomo 40° and 20° fast:	c. 24 cm.p.s.
Tomo 40° and 20° slow:	c. 12 cm.p.s.
Zono 8°:	c. 9 cm.p.s.

## Approximate Exposure Times:

Plane					
Height	40° <<	40° <	20° <<	20° <	8°
24 cm	c.2,1 sec	c.4,1 sec	c.1,05 sec	c.2,1 sec	c.1,0 sec
18 cm	c.2,1 sec	c.4,6 sec	c.1,1 sec	c.2,3 sec	c.1.1 sec
12 cm	c.2,5 sec	c.5,0 sec	c.1,25 sec	c.2,5 sec	c.1,2 sec
6 cm	c.2,6 sec	c.5,2 sec	c.1,3 sec	c.2,6 sec	c.1,3 sec

### 1.3 Measures and Weights for Shipment

1 Crate                      1350 mm x 780 mm x 600 mm  
                                 c.53 in. x c.30,7 in.x c.23,6 in.

Gross weight    c. 125 kg    274 lbs.  
Net weight       c. 58 kg    127 lbs.

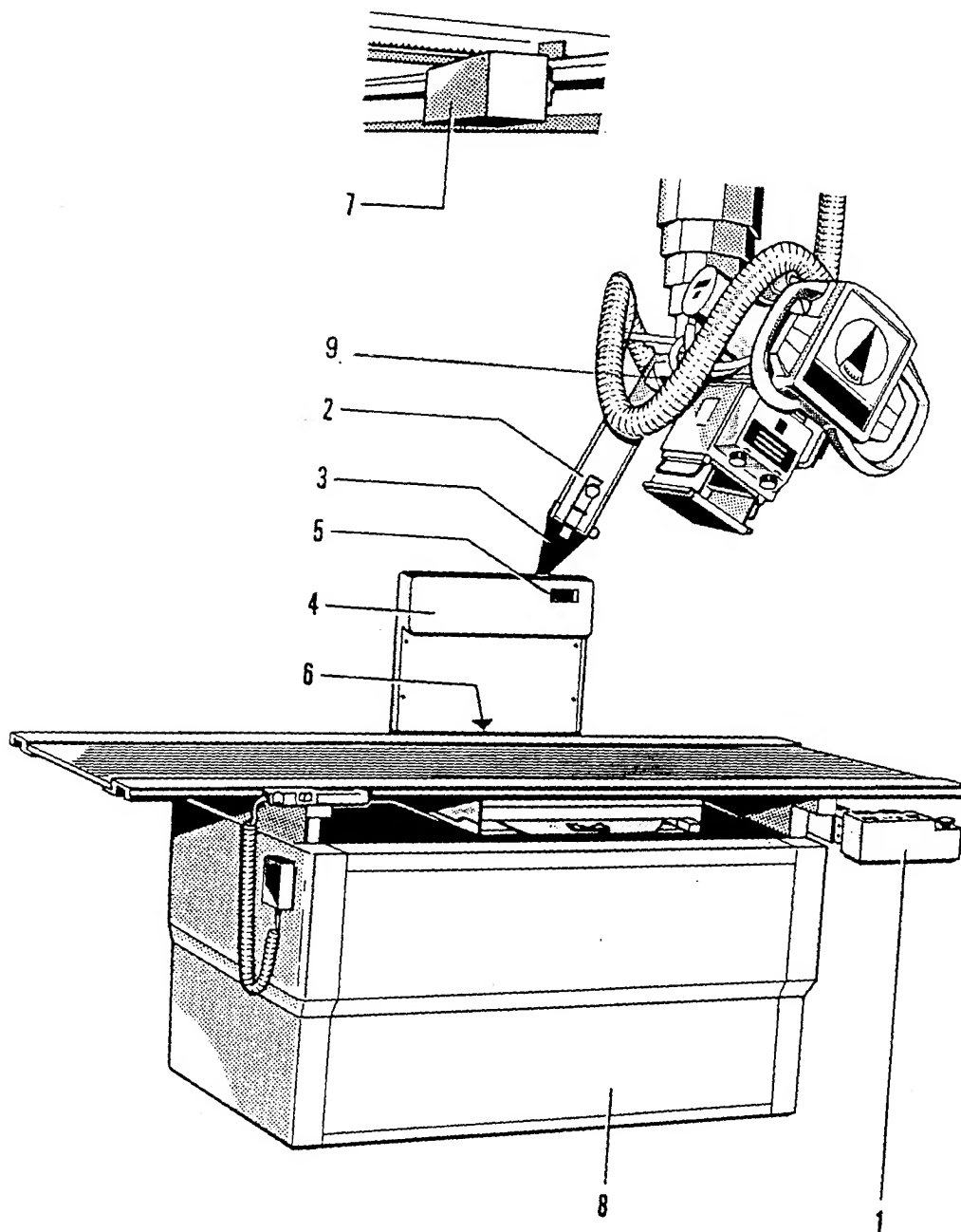
#### 1.3.1 During regular work

Temperature:                      -25 to 70°  
Humidity:                            5% to 95%  
Air pressure:                        700 hPa to 1100 hPa

#### 1.3.2 During transport

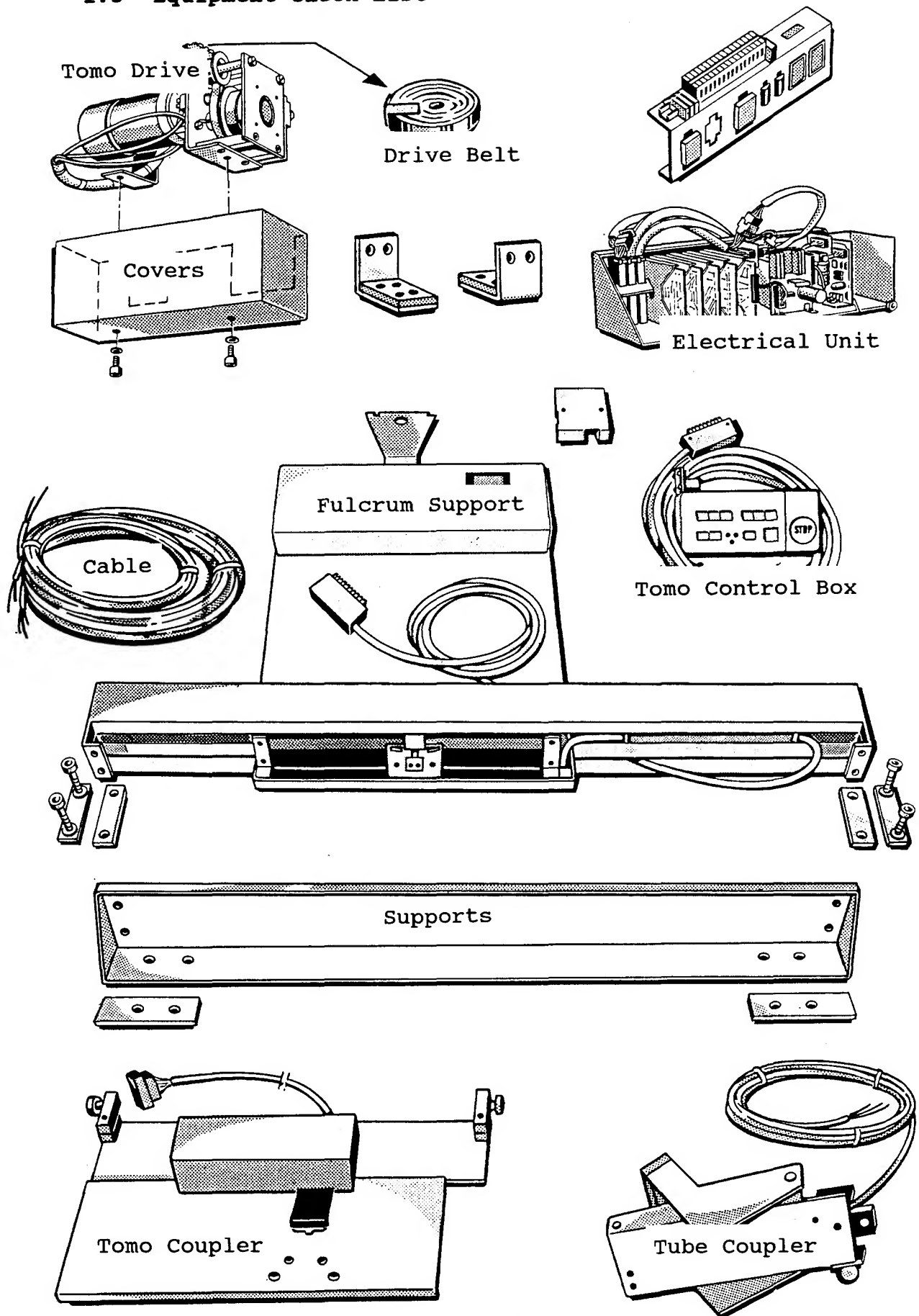
Temperature:                        10° to 40°  
Humidity:                            20% to 80%  
Air pressure:                        700 hPa to 1100hPa

## 1.4 Component Designations



1. Tomo Control Box
2. Tube Coupler
3. Coupling Bar
4. Fulcrum Support
5. Digital Display
6. Tomo Coupler
7. Tomo Drive
8. Electrical Unit
9. Interlock Knob

## 1.5 Equipment Check List



## **1.6 Mains Connection Data**

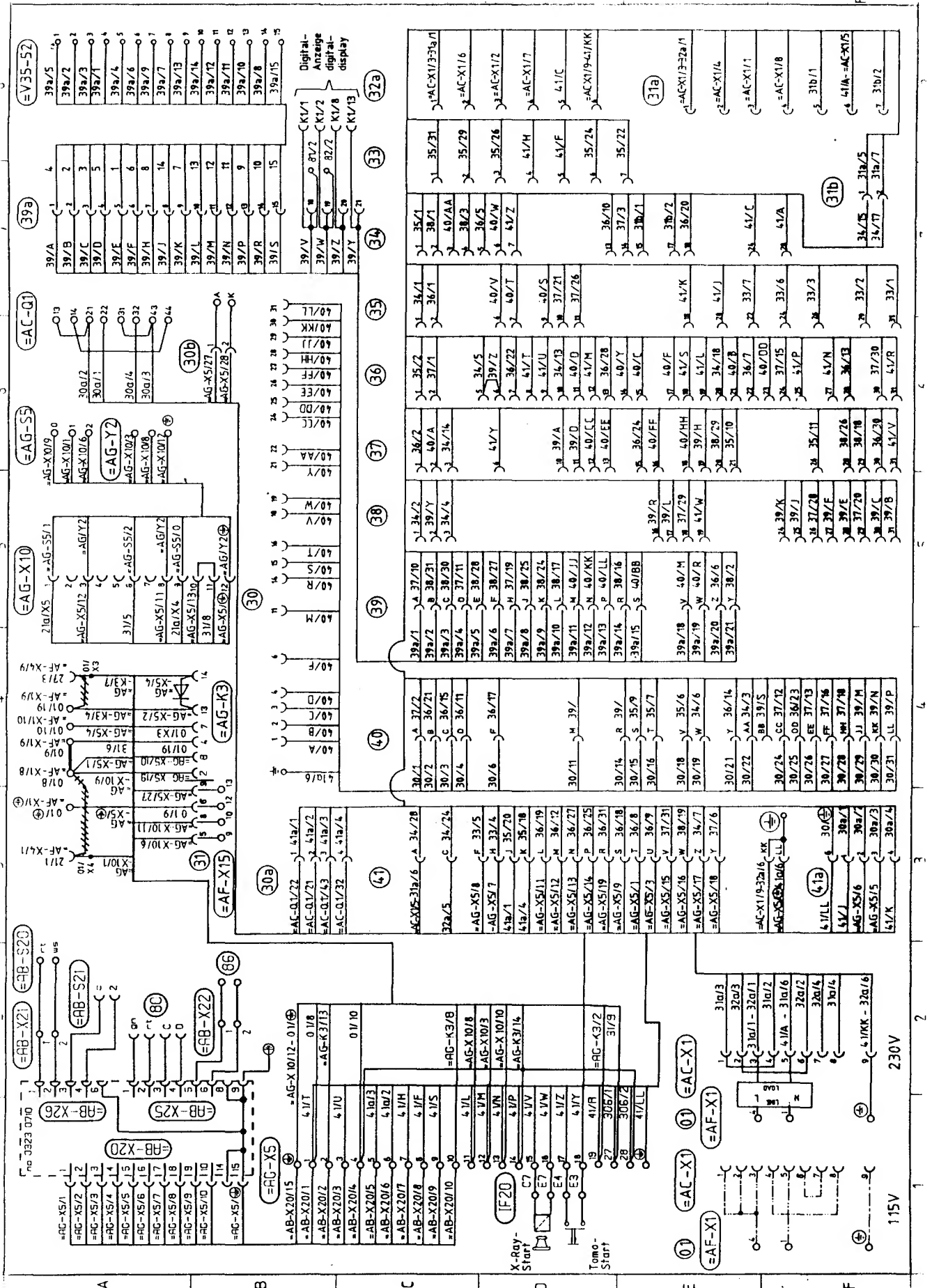
The mains connection is carried out via plug-in connectors of the ET 2000.

Mains Connection:	230 V or 115 V
Frequency:	50/60 Hz
Nominal Current:	A 1 (2)
Nominal Capacity:	0,2 KVA

## **1.7 Measuring Instruments Required**

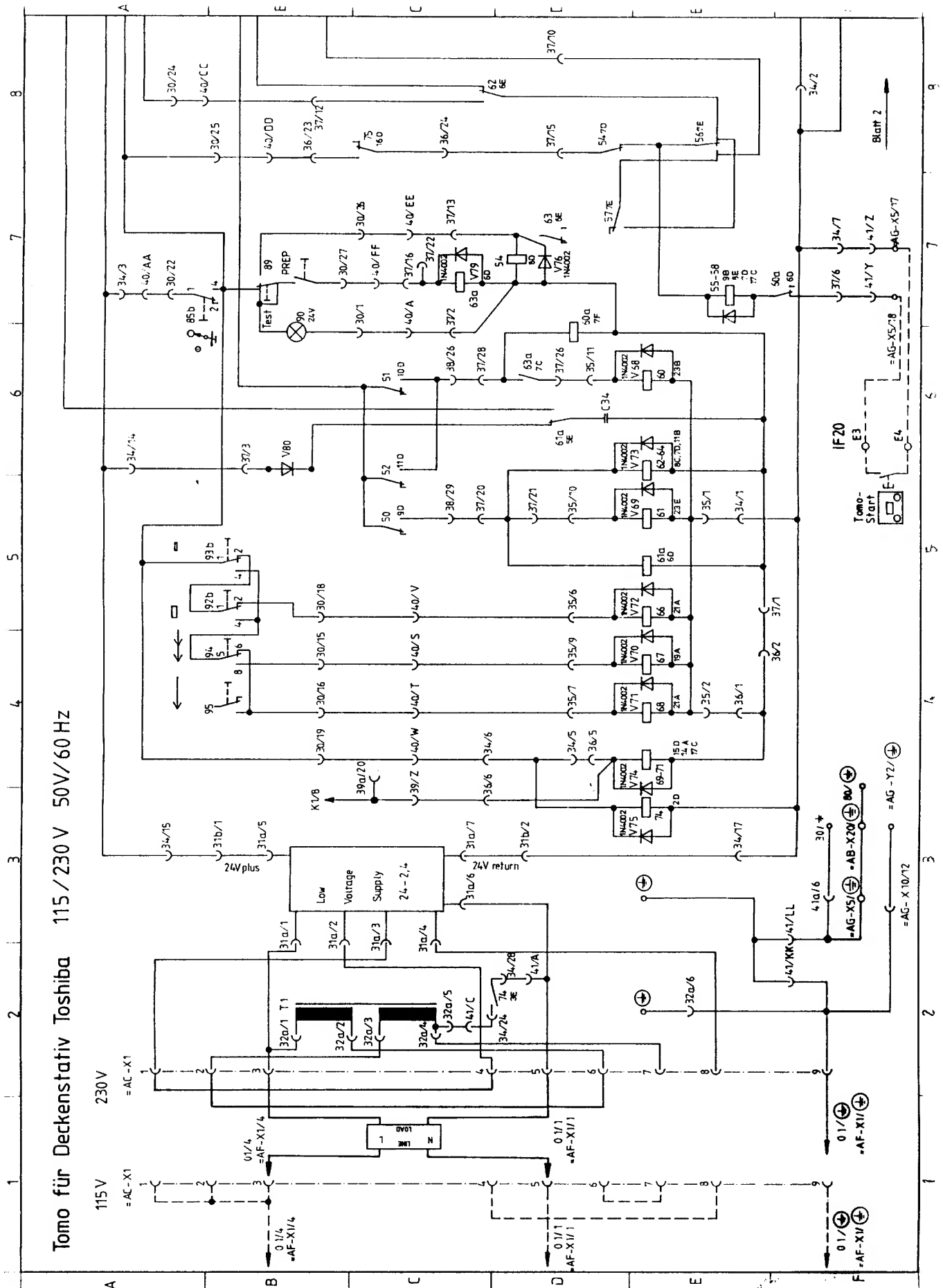
Air Level  
Phantom

# 1.8 Wiring Diagram

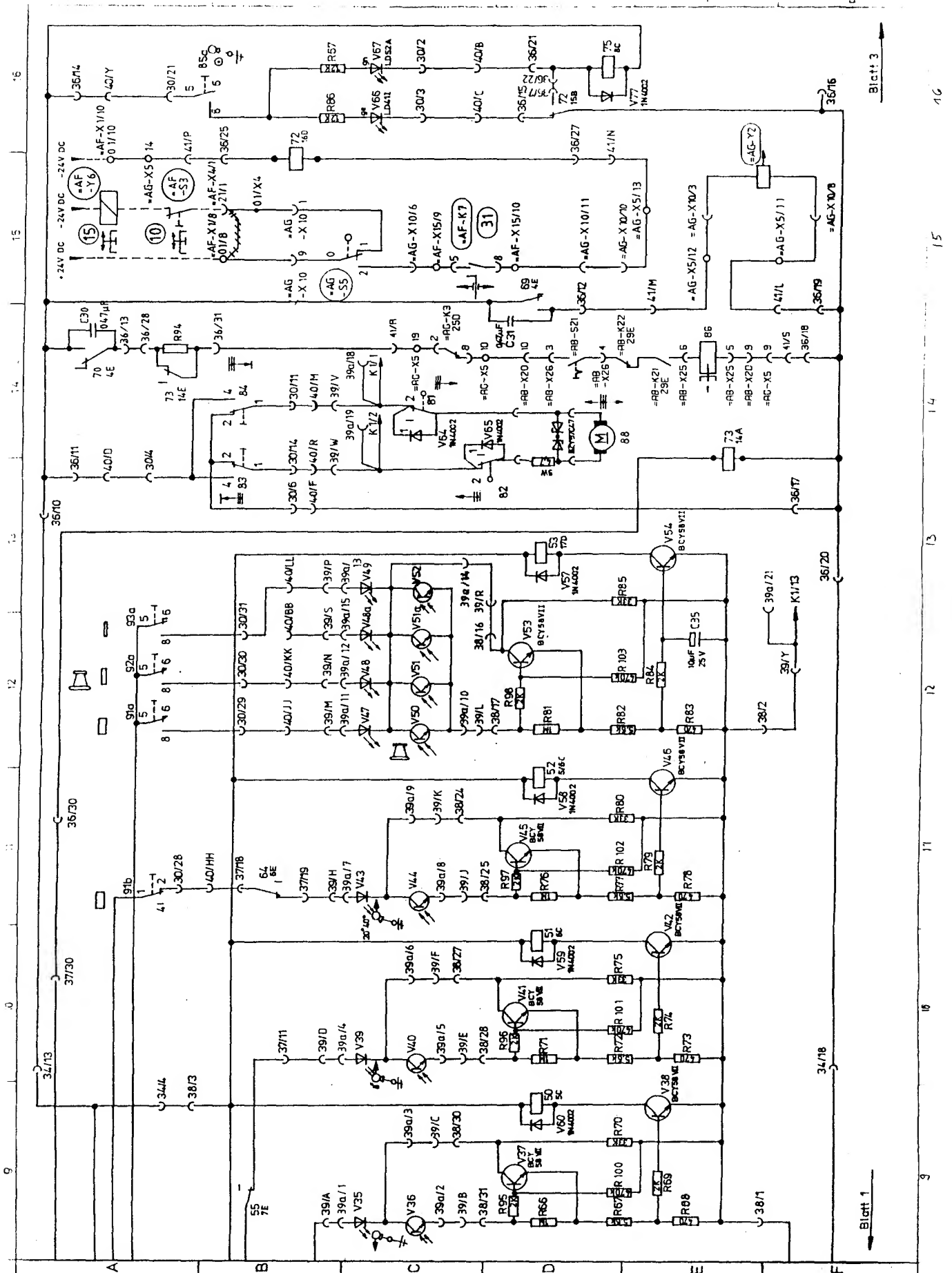




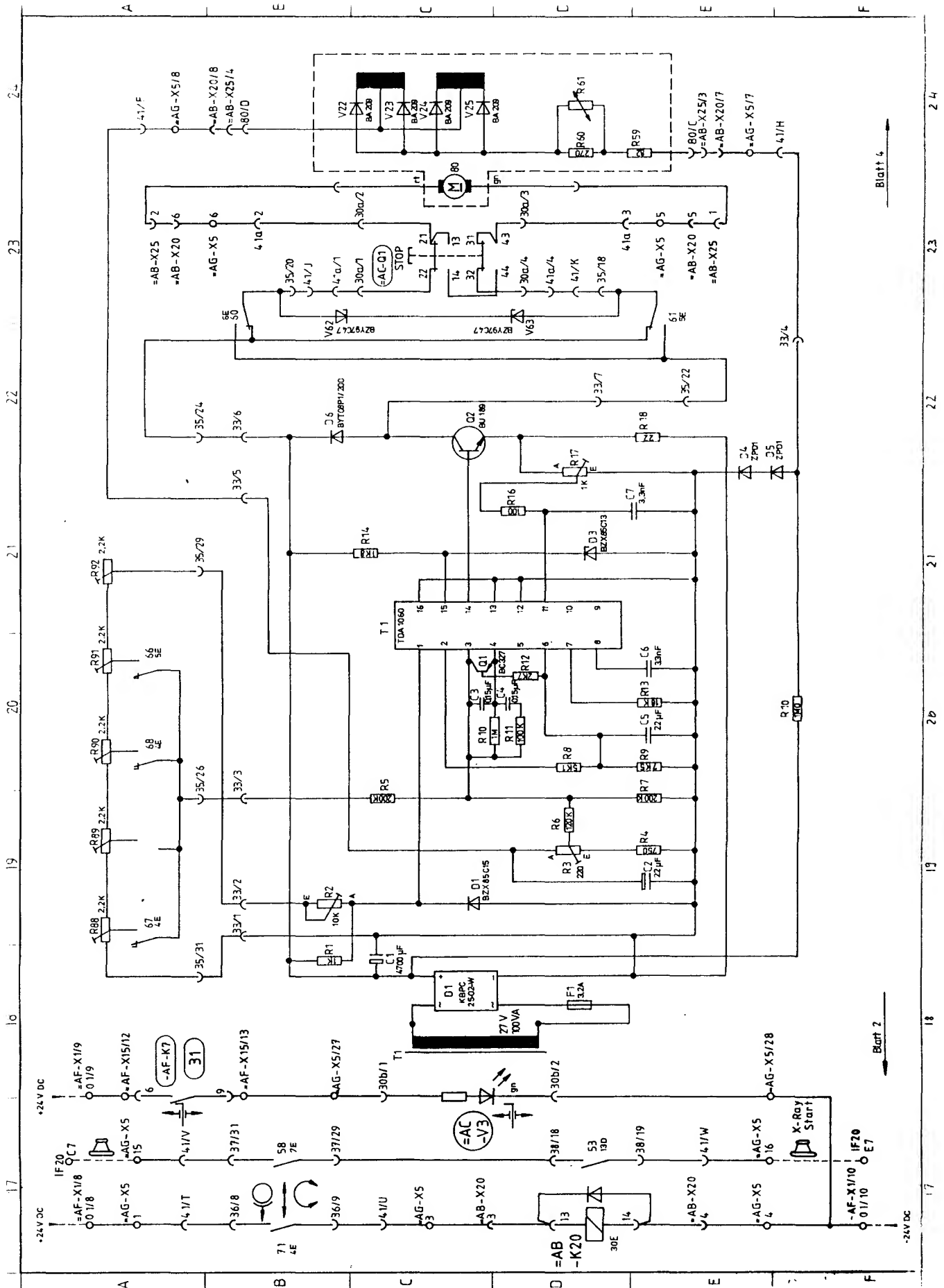
# 1.8.1 Current Diagram



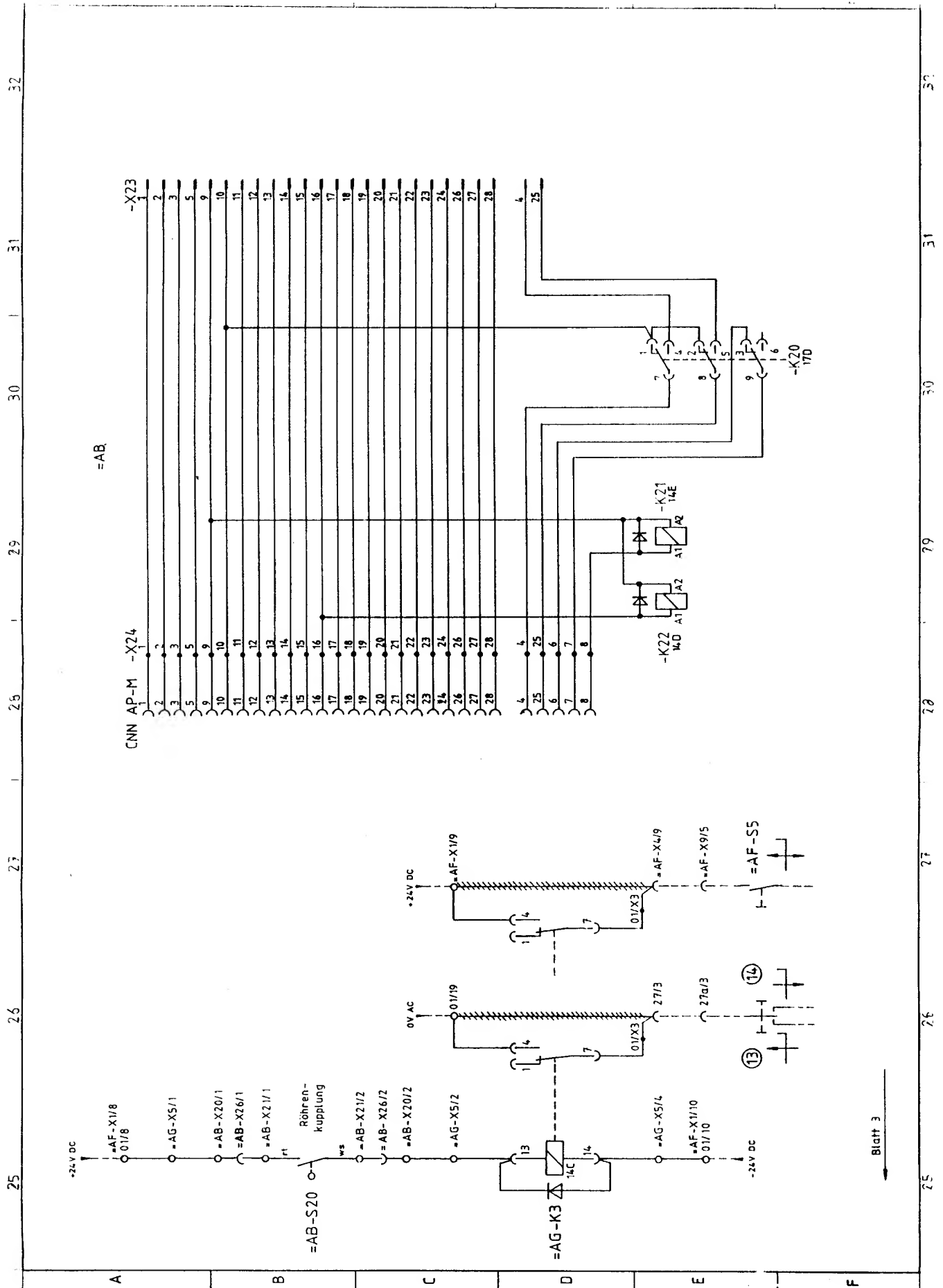
## 1.8.2 Current Diagram



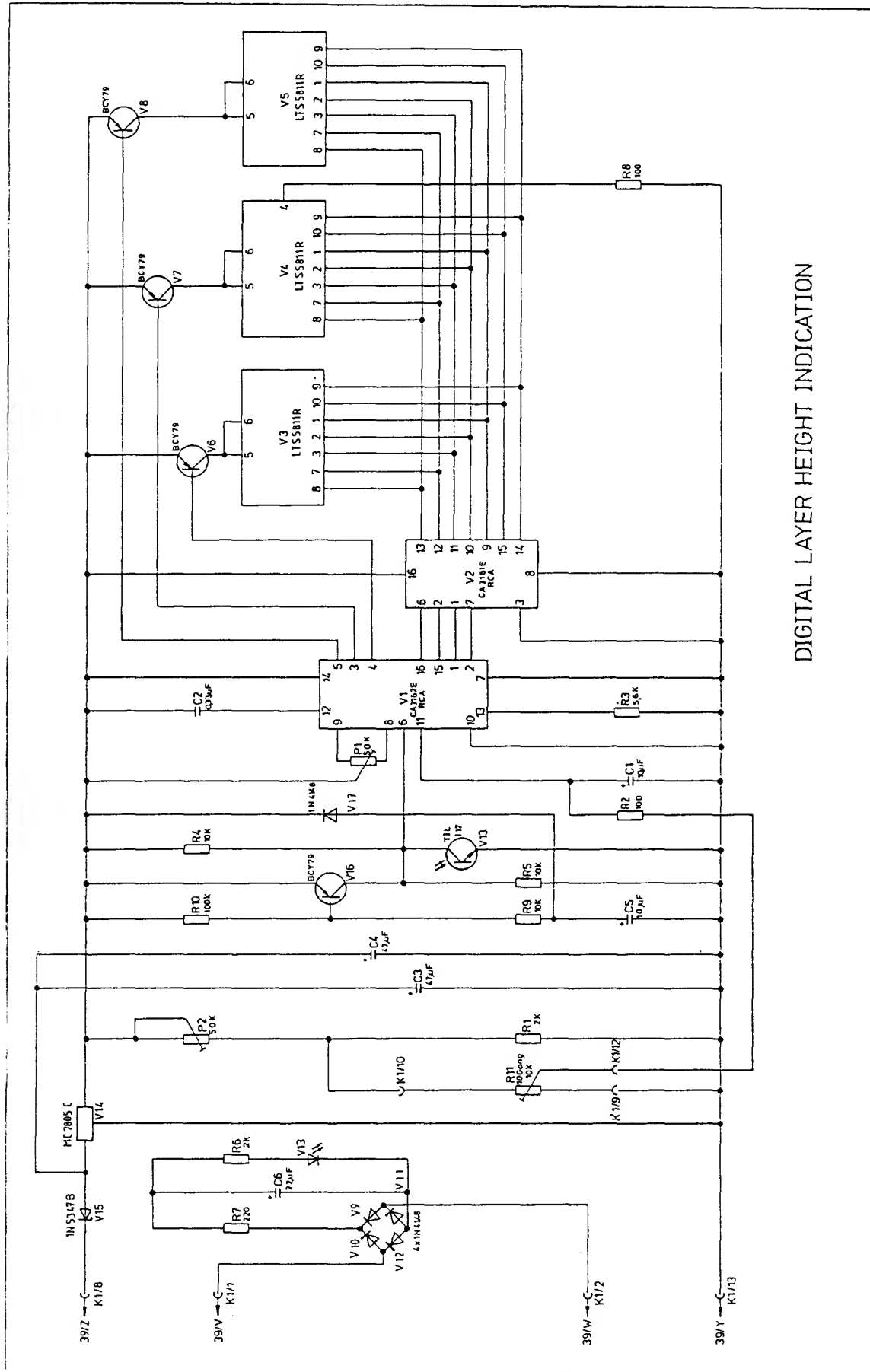
### 1.8.3 Current Diagram



# 1.8.4 Current Diagram



### 1.8.5. Current Diagram of Digital Display



DIGITAL LAYER HEIGHT INDICATION

## 1.9 .Current Diagram of Power Supply

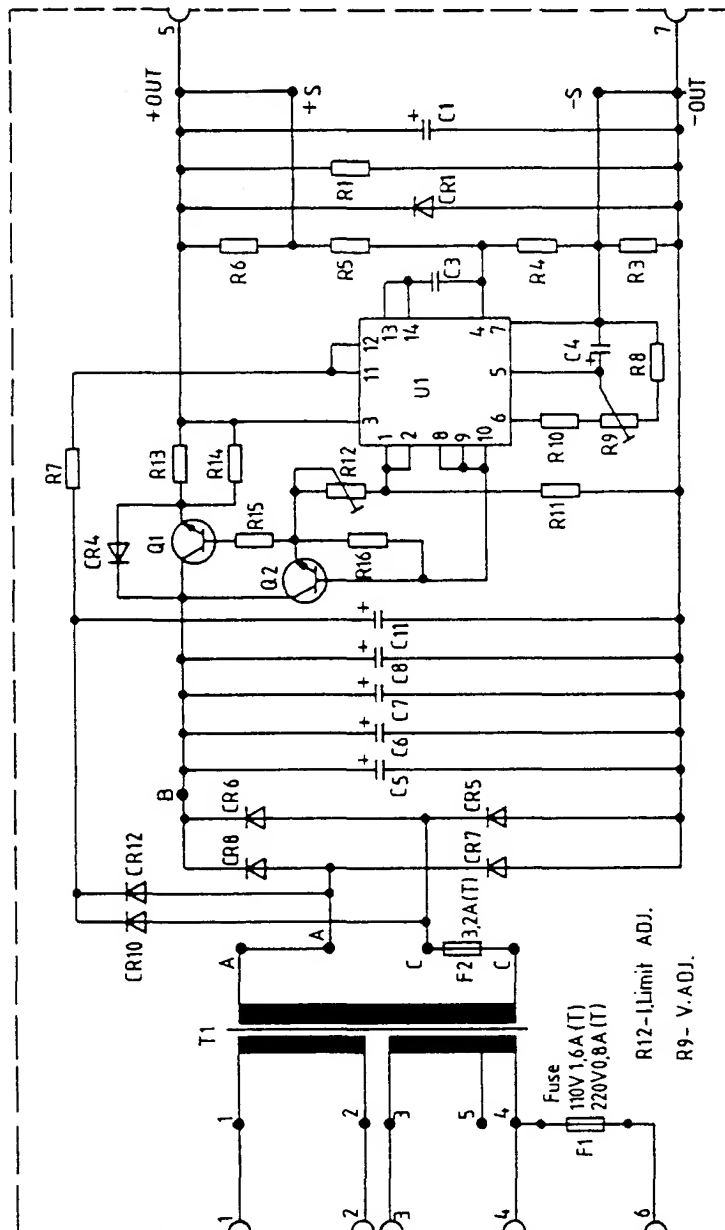
R1-3,3k $\Omega$   
 R3-6,8 $\Omega$   
 R4-1,65k $\Omega$   
 R5-6,04k $\Omega$   
 R6-6,8 $\Omega$   
 R7-6,8 $\Omega$   
 R8-3,65k $\Omega$   
 R9-1k $\Omega$   
 R10-1,1k $\Omega$   
 R11-6,8k $\Omega$   
 R12-500 $\Omega$   
 R13-0,68 $\Omega$   
 R14-0,68 $\Omega$   
 R15-Brücke  
 R16-3k $\Omega$

C1-470 $\mu$ F/35V  
 C3-220nF/1kV  
 C4-10 $\mu$ F/50V  
 C5-1000 $\mu$ F/63V  
 C6-1000 $\mu$ F/63V  
 C7-1000 $\mu$ F/63V  
 C8-1000 $\mu$ F/63V  
 C11-220 $\mu$ F/63V

CR1-1N4002  
 CR4-1N4003  
 CR5-1N5401  
 CR6-1N5401  
 CR7-1N5401  
 CR8-1N5401  
 CR10-1N4002  
 CR12-1N4002

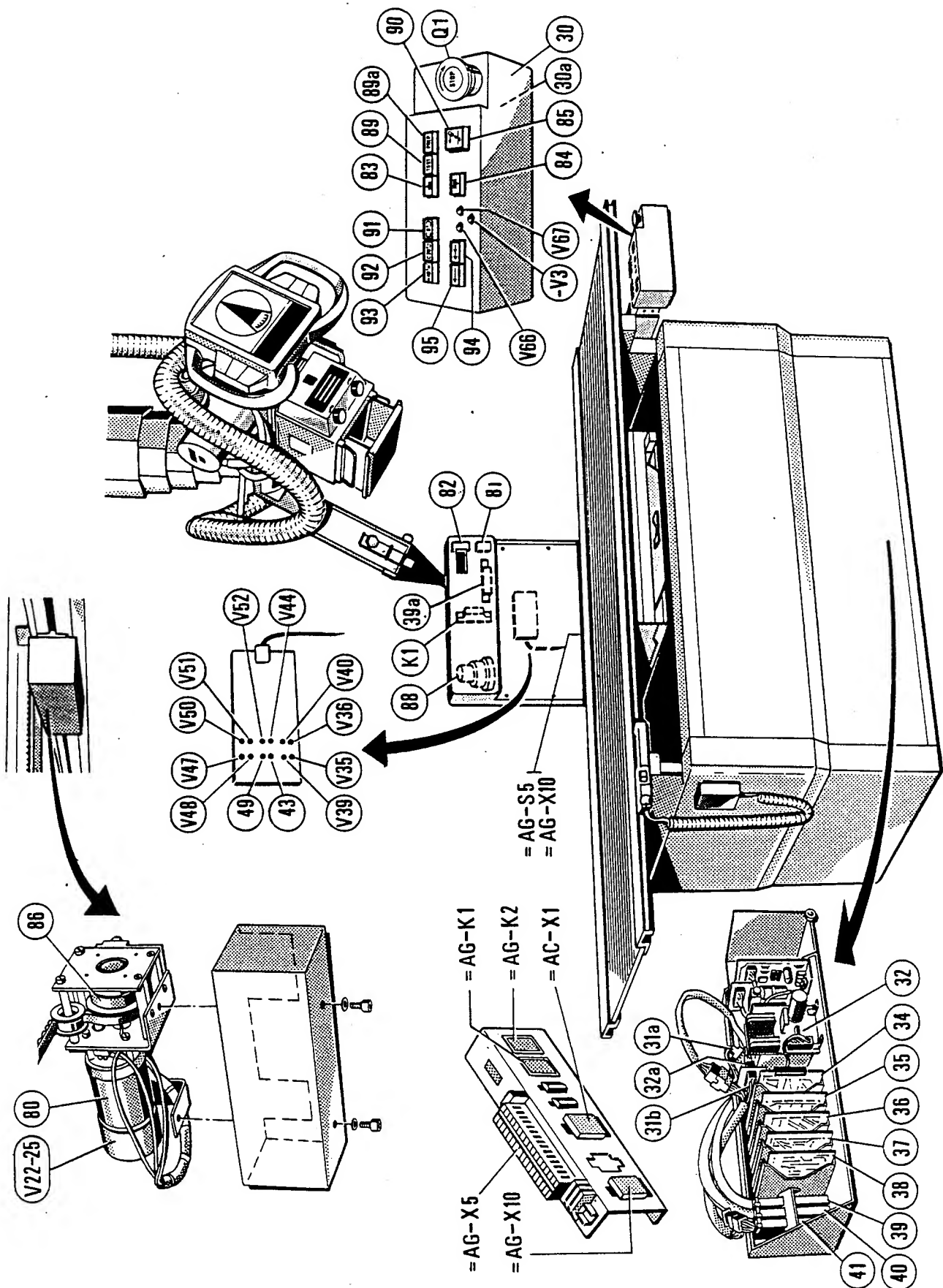
Q1-2N3055  
 Q2-P31823

U1-LM723CN

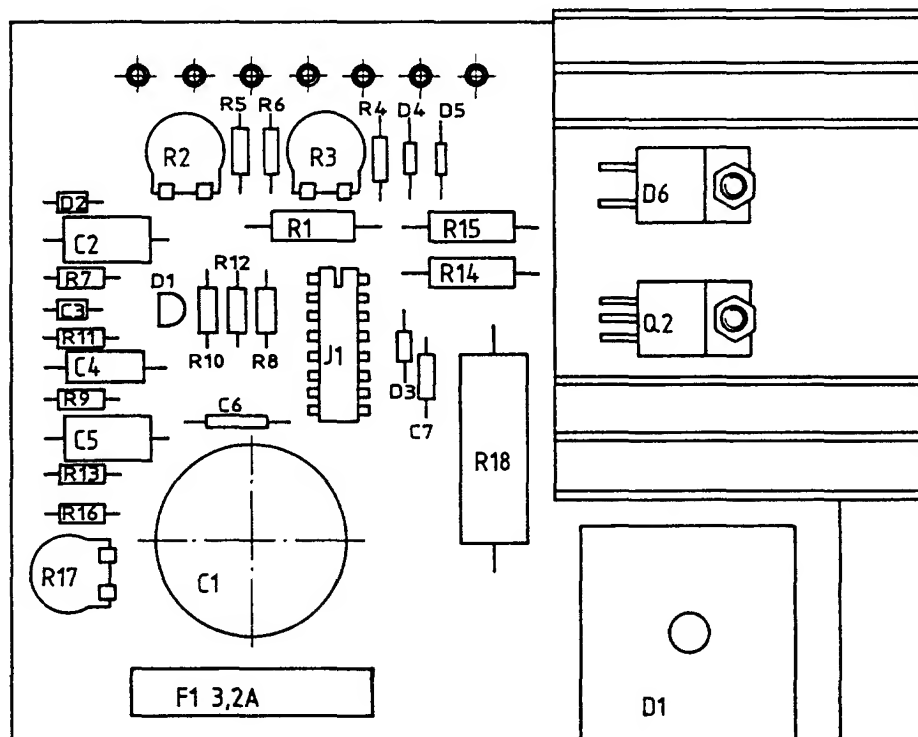


Condor, D.C. Power Supply HC. 24-2,4A

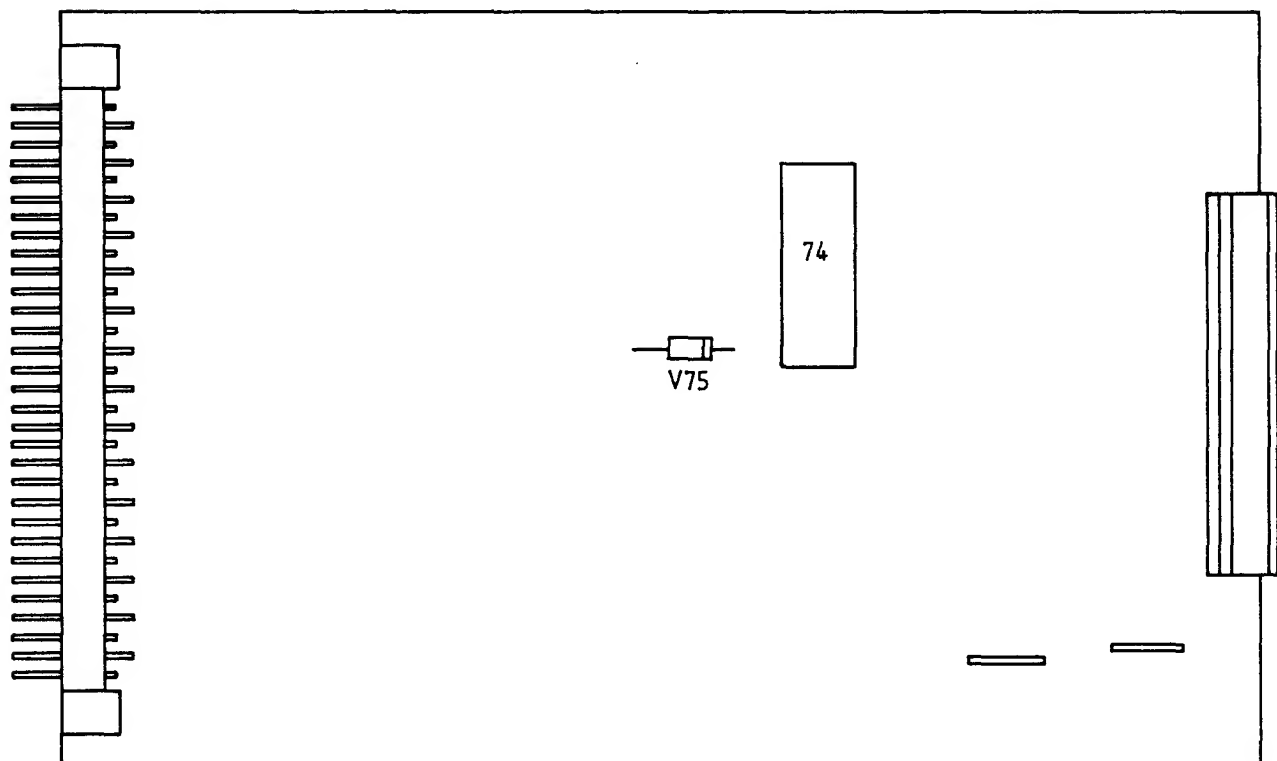
### 1.10 Physical Location of Electrical Components



# 1.10.1 Electric Field Installation Diagram



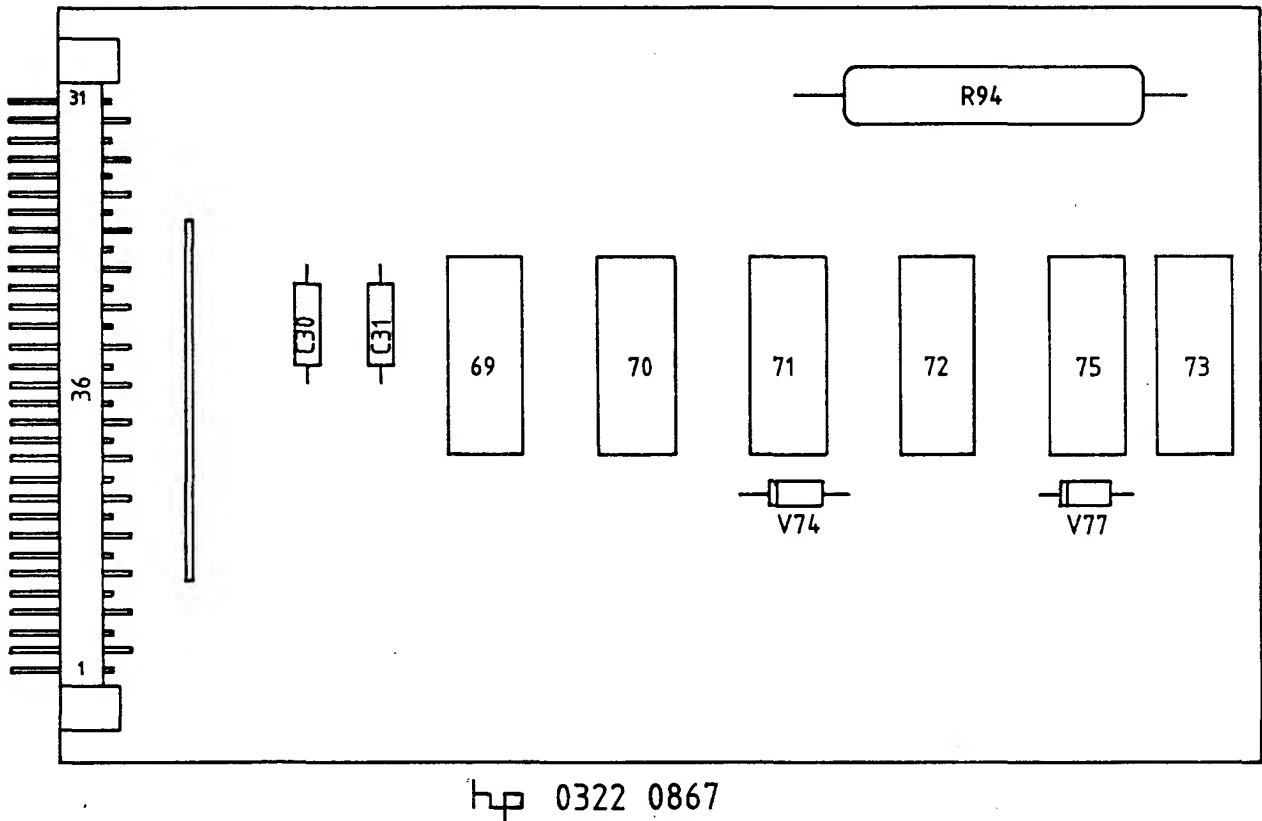
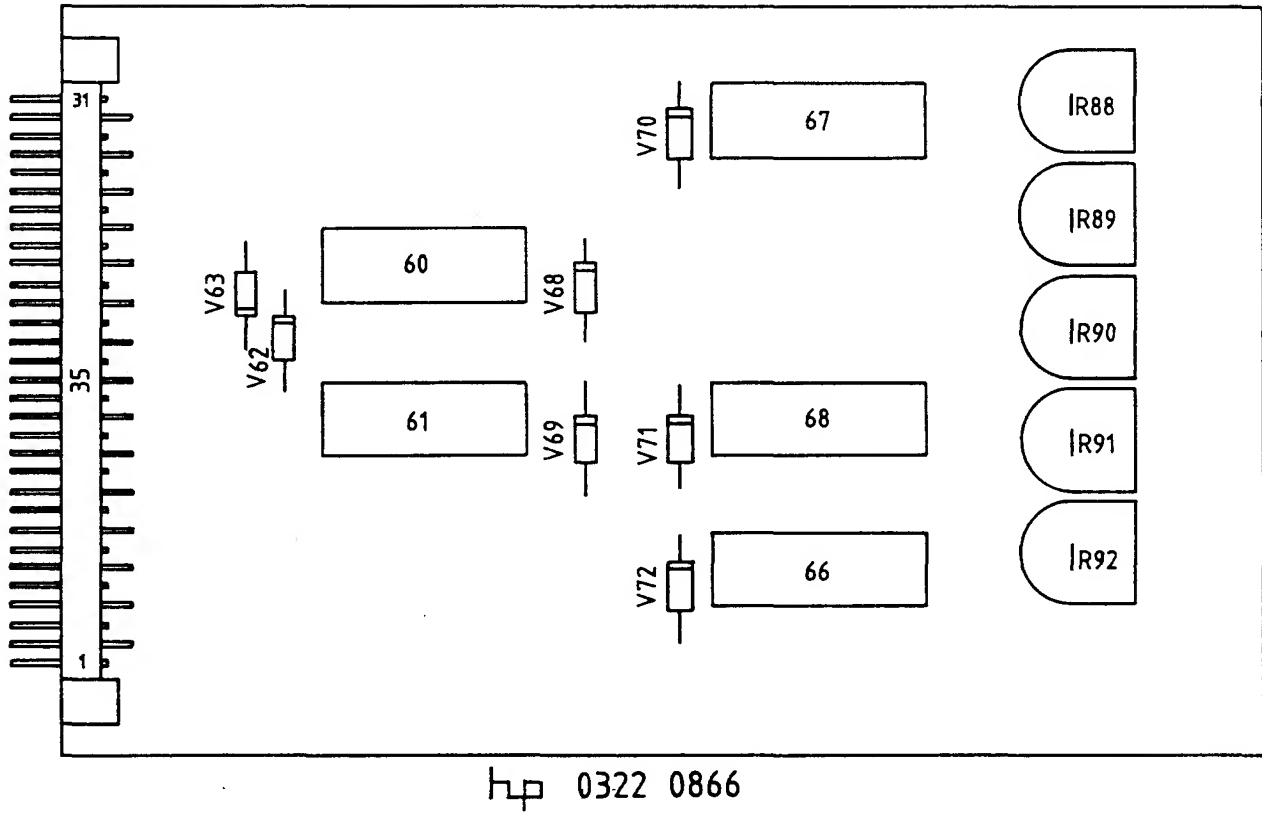
0006 0248 a



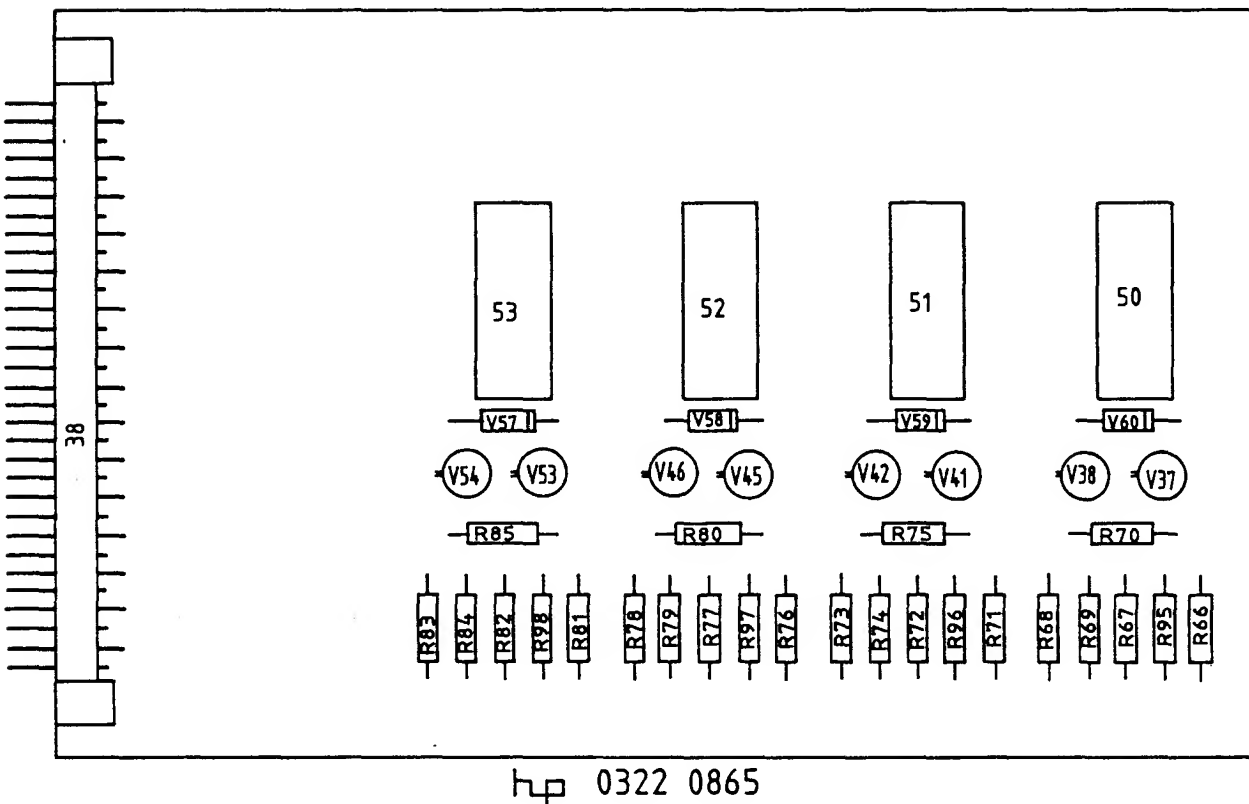
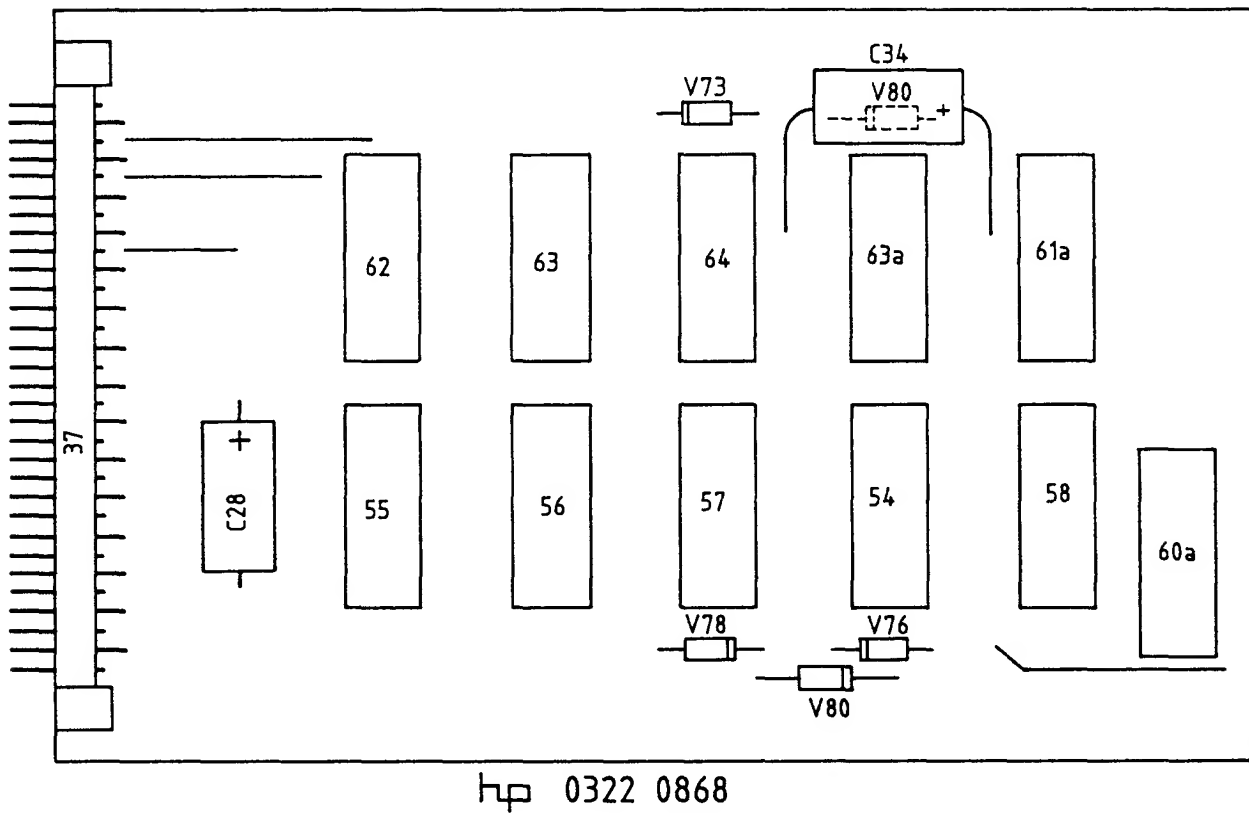
hp 0322 0869



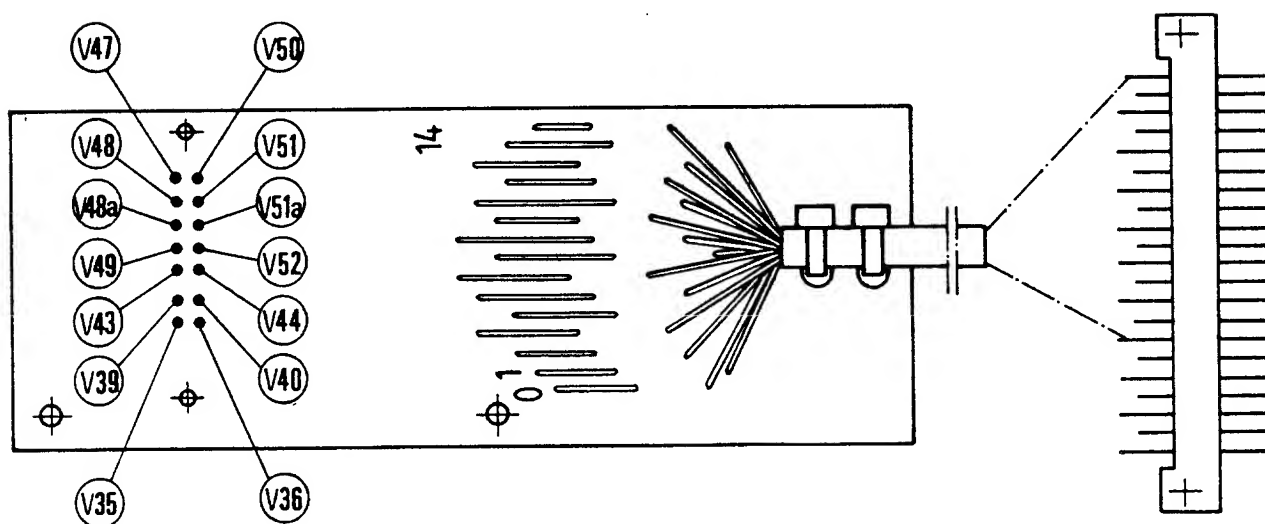
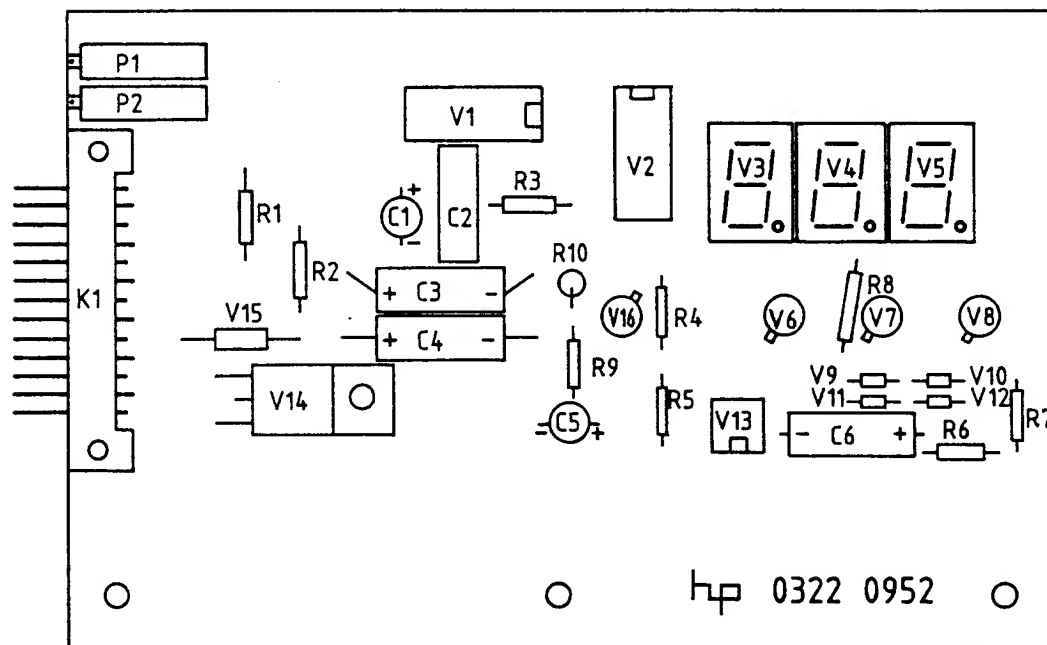
# 1.10.2 Electric Field Installation Diagram



### 1.10.3 Electric Field Installation Diagram



#### 1.10.4 Electric Field Installation Diagram



## **2. INSTALLATION**

### **2.1 Uncrating**

Remove packing material. Check for completeness and upon shipping damage.

### **2.2 Removal of Covers**

Drive the ET 2000 of maximum height.

Switch ET 2000 power off.

Remove plastic caps (Fig. 1, Item 1). Loosen two socket screws with 4 mm wrench. Swing cover (Item 2) to the front and pull up. Remove the two screws (Item 4) and take out the strut (Item 3). Lift up the trim cover (Item 5) a little bit, tilt it to the front and pull down.

Remove screws (Fig. 1, Item 7 + 8) and (Fig. 2, Item 10, 12, and 14).

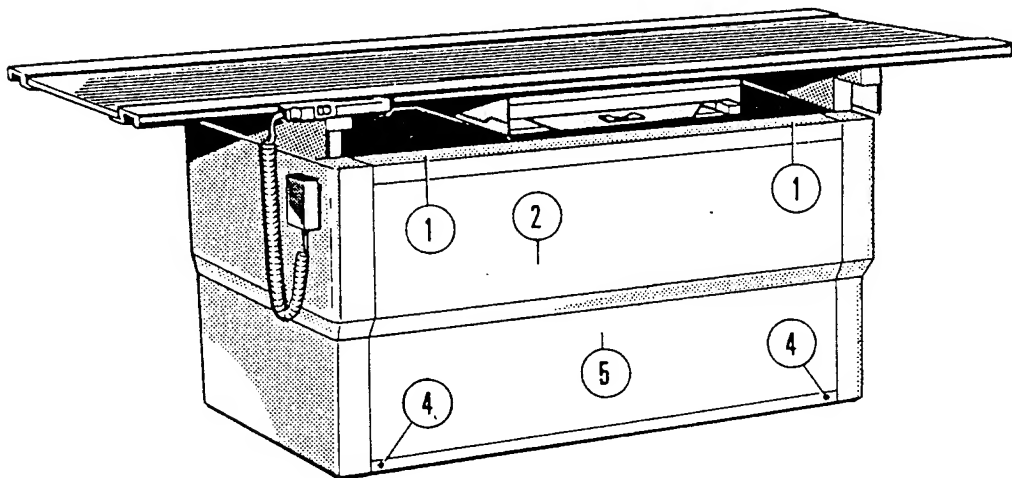


Fig.1

### **2.3 Mounting of Bracket**

Hold bracket (Fig. 2, Item 8) from the back to the table, insert the reinforcing strips and tighten with screws.

#### **Attention:**

The bracket has to be conclusive with the table frame border.

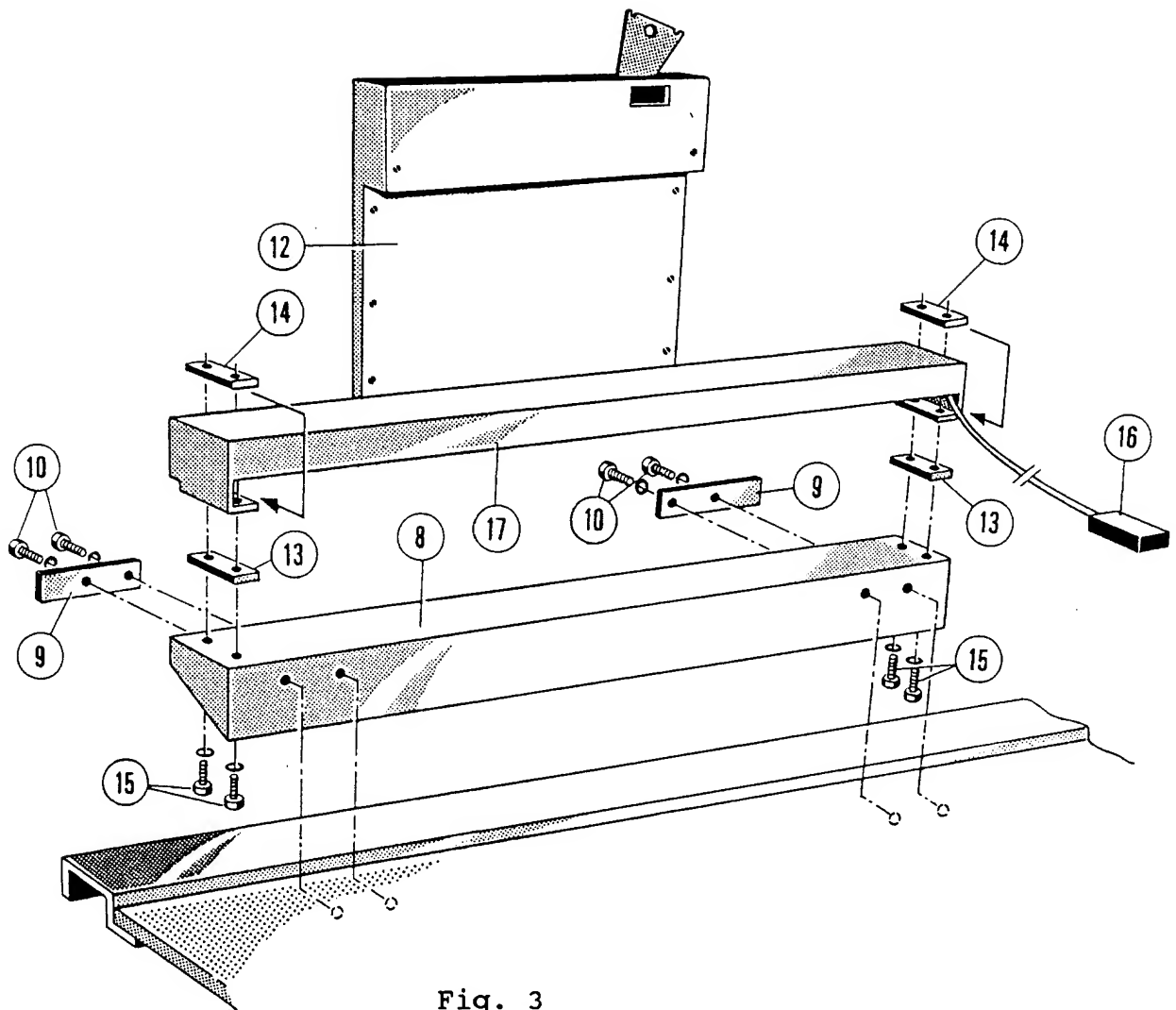


Fig. 3

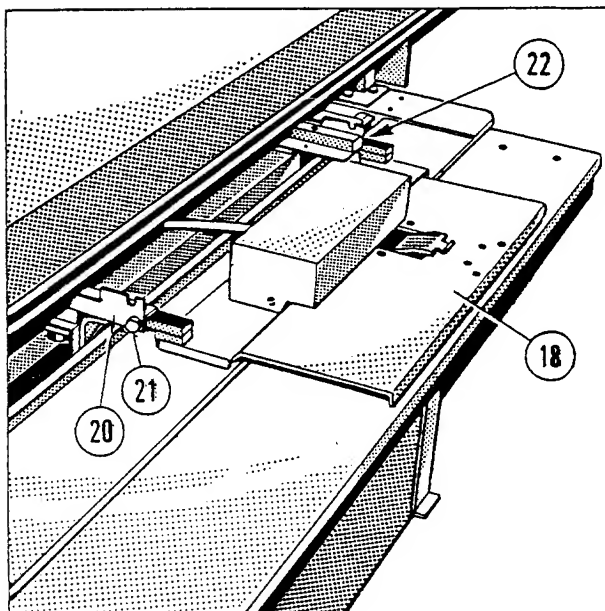


Fig. 5

## 2.4 Tomo Coupler Installation

Install the Bucky-Tomo-Coupler (Fig. 5, Item 18) with screws (Item 21 + 22) to the carriage of the Bucky (Item 20).

Place plug with cables up to the plate for parts.

## 2.5 Mounting of Fulcrum Tower

Place fulcrum tower (Fig. 3, Item 12) on bracket (Item 8). Put through cables with plug (Item 16) between rear table frame rail and Bucky carriage guide rail. Put two stiffening plates (Item 13) on both sides under balance (Item 17). Fasten fulcrum tower with screws (Item 15) and thread rail (Item 14).

## 2.6 Mounting of Control Box

Fasten control box (Fig. 6, Item 25) to table frame (Item 26) with screws. Remove cover of side wall (Item 31) and put cables for control box (Item 29) through bore-hole. Put cables in cable guide box (Item 31). Check whether there is enough space for the cables. Mount cable box to table and fasten cables on the bottom of the tube side with cable fastener and then, lay them down.

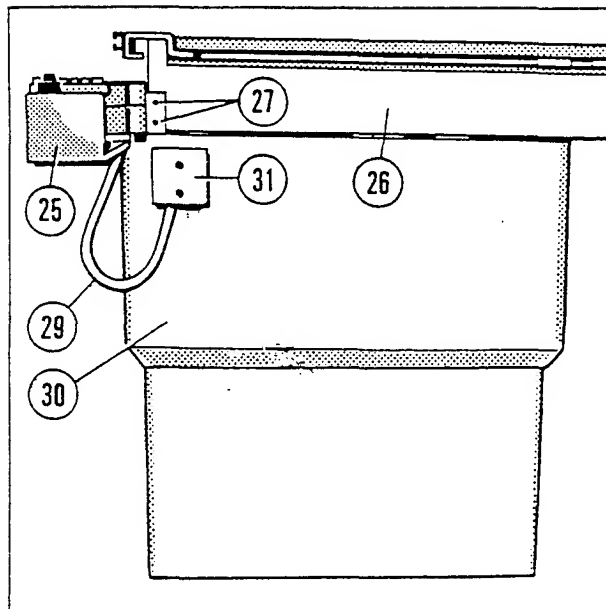


Fig. 6

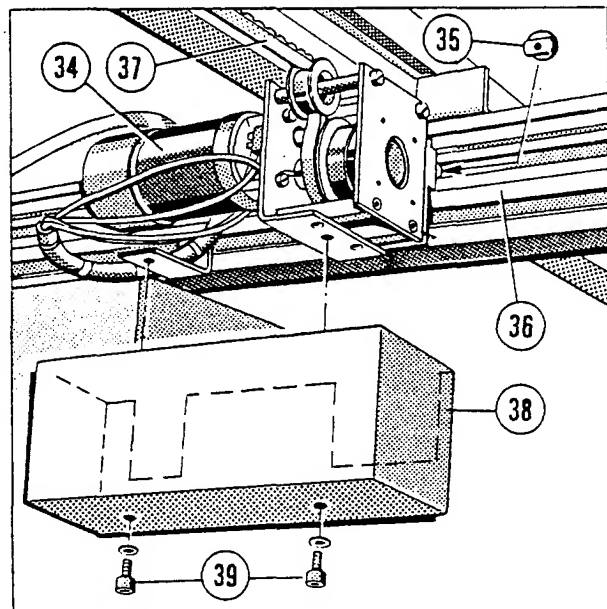


Fig. 7

## 2.7 Mounting of Motor Drive

Move in sliding block (Fig. 7, Item 35) in cross guide rail (Item 36) and fasten column drive motor (Item 34) temporarily.

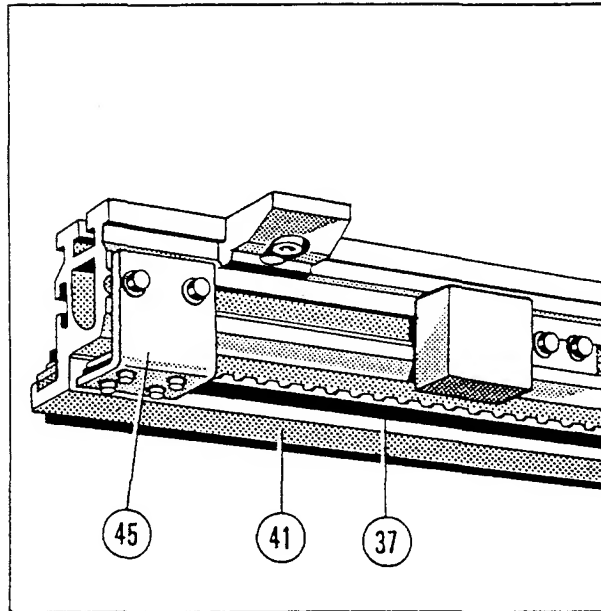


Fig. 8

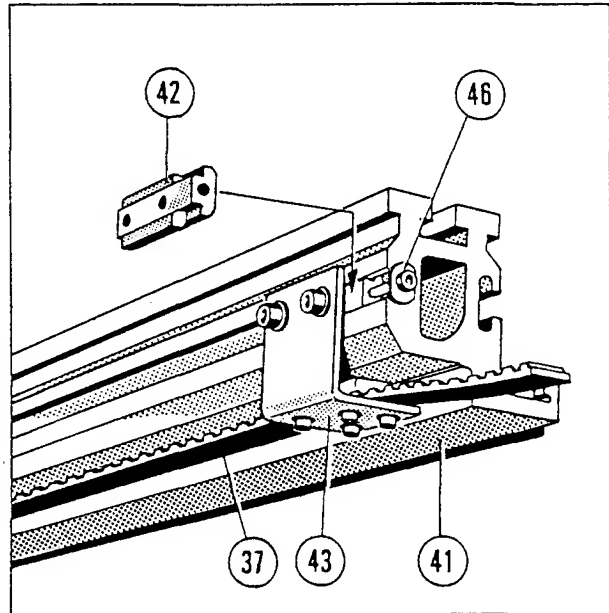


Fig. 9

## 2.8 Mounting of Drive Motor

Mount belt fixing angle (Fig. 8, Item 45) on the left-hand side to ceiling guide rail (Item 41). Mount belt fixing angle (Fig. 9, Item 43) under consideration of the tension to ceiling guide rail (Item 41).

## 2.9 Tightening of Drive Belt

Insert drive belt (Fig. 8 und Fig. 9, Item 37) to both belt fixing angle (Item 49 and Item 37) and tighten to fixing screw (Fig. 9, Item 46). Align column drive motor and fasten finally.

## 2.10 Mounting of Tube Coupler

Remove cover from ceiling column (Fig. 11, Item 53). Fasten tube coupler with screws (Fig. 10, Item 48) under consideration of the 8 mm space to axis of rotation (Item 49) of the ceiling column (Item 51). Put connection cable over the flexible tube to ceiling column guide.

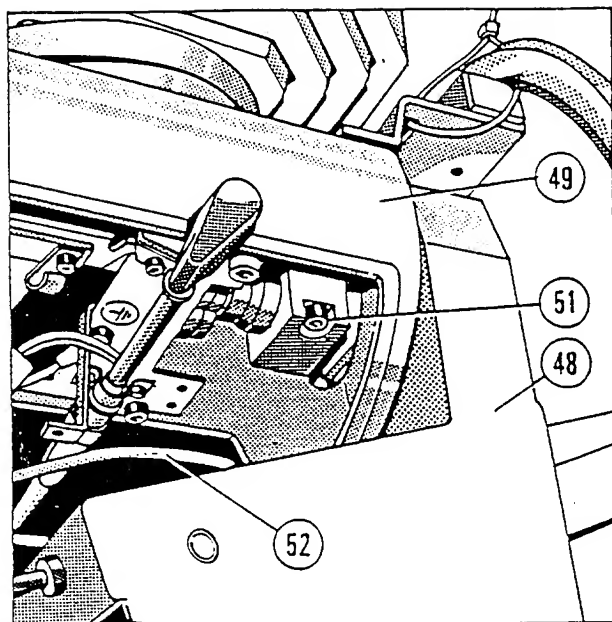


Fig. 10

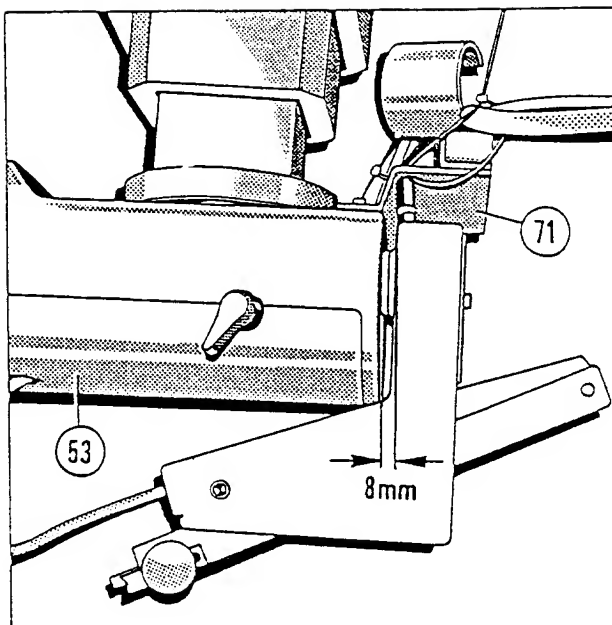


Fig. 11

## 2.10a Modification of the DST-100A Support Arm

Remove the support arm cover, and brackets A and B.  
See (Fig. 11a).

Mount bracket C after removing bracket B (with two M4 Philips plan head screws. See (Fig. 11b)

Remove the two M3 x 8 Philips screws from the solenoid, and two M4 x 12 Philips screws from the solenoid mounting plate, and use the screws to secure the interlock switch unit See (Fig. 12)

Mount bracket D after removing bracket A. See (Fig. 12)  
Remove the resin cap from standard support arm and mount the joint and connecting plate. See (Fig. 12)

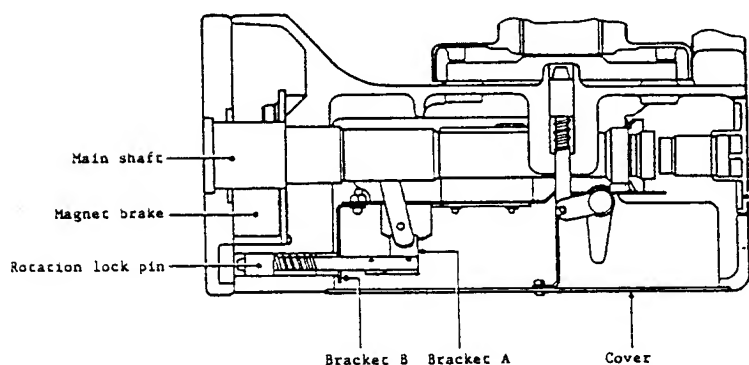


Fig. 11a

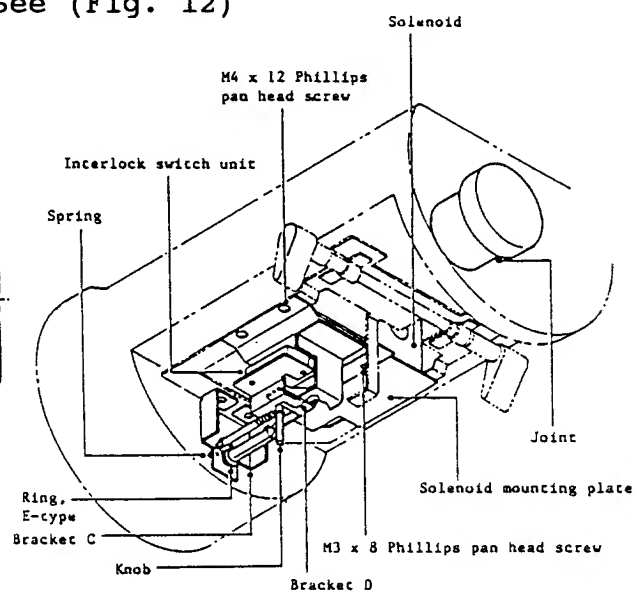


Fig. 11b



### 2.11 Mounting of Tomo-Interface

Mount tomo-interface angle (Fig. 12, Item 55) to electro component plate (Item 56).

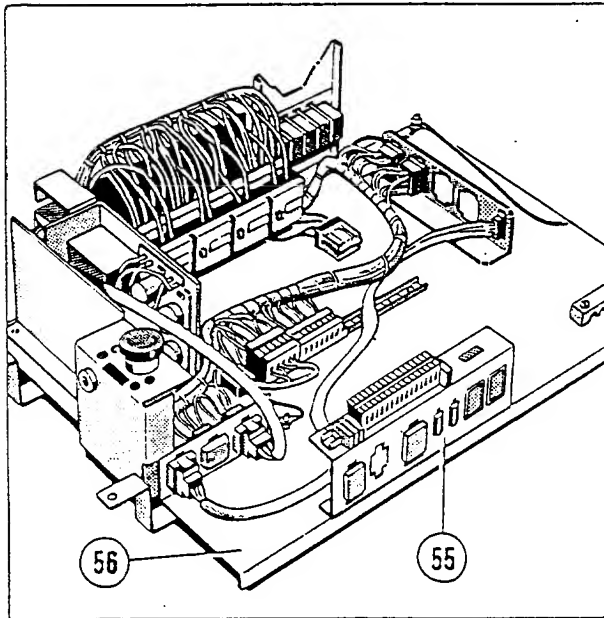


Fig. 12

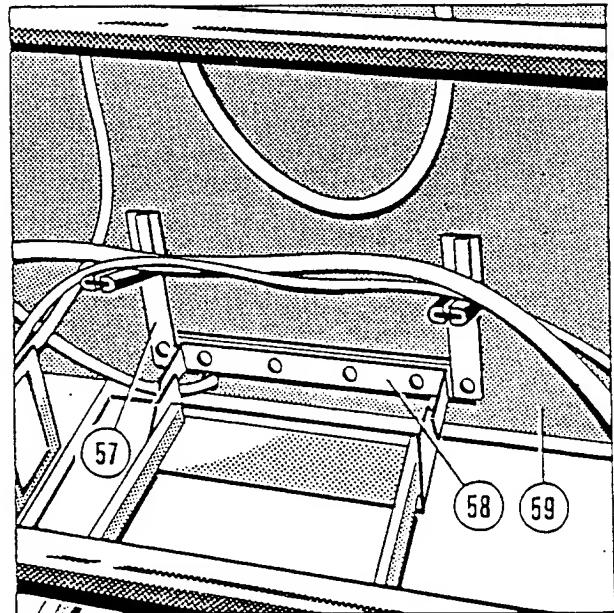


Fig. 13

### 2.12 Installation of Electrical Unit

Mount drawer guide (Fig. 13, Item 58) with both cable guide rail angle (Item 57) to back wall (Item 57). Insert electrical unit (Fig. 14, Item 61) to drawer guide.

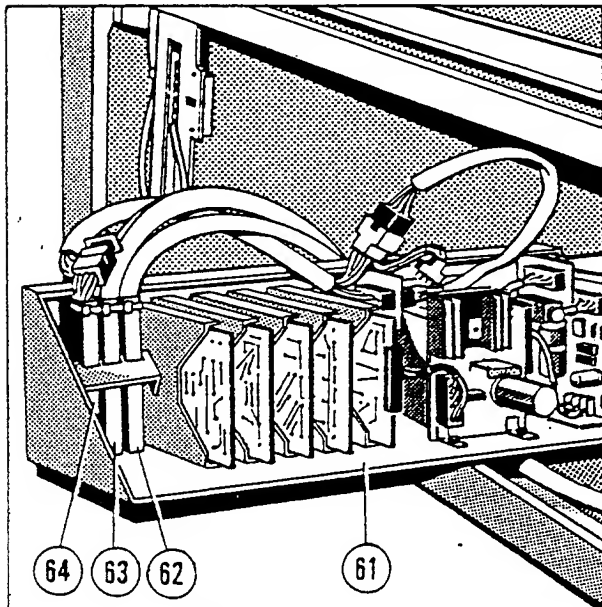


Fig. 14

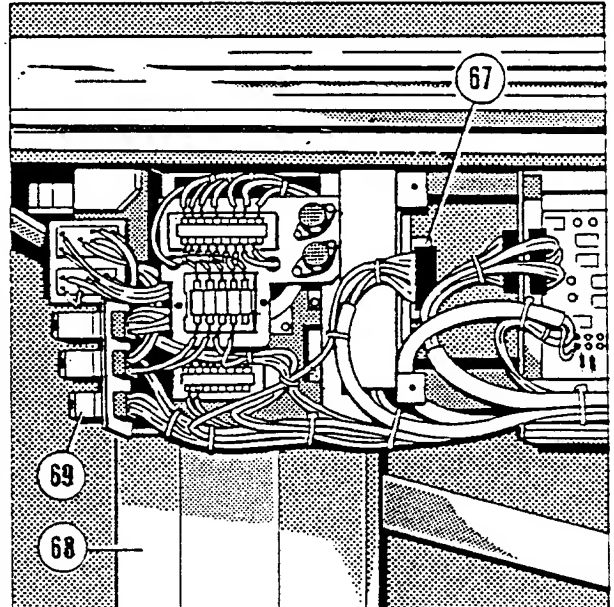


Fig. 15

### 2.13 Insert Relais Board to Ceiling Column

Disconnect plug-in connection CNN AP-M. Fasten relais

board 0323 0710 to ceiling column mechanically.

## 2.14 Cabeling

### Attention:

Pay attention to wiring diagram !!!

### Part Plate (Fig. 12)

Press cable beam to relais =AF-X15 and clamp to screw terminal =AF-X1. Line off =AF-X1 (comes from =AF-X9) uncouple and tighten unsolvable with plug 01/X3. Uncouple line =AF-X1/8 (comes from =AF-X1) and tighten unsolvable to plug 01/X4.

### Ceiling Column (Fig. 15)

Put plug CNN AP-M to plug-in connexion =AB-X23 of the relais board 0323 0710. Put new plug (coming from the relais board) to pin plug CNN AP-M. Place connection cable of the ET 2000 to ceiling column and connect plug =AB-X5 to relais board. Place cable from the tube coupler over the grooved flexible tube to relais board and couple for motor drive (Fig. 6) from the motor drive starting to relais board and couple with plug =AB-X25. Then connect each line to the motor drive considering the colour as well as the desription. Put in tomo electric (Fig. 14) cable control box (Item 62) cable fulcrum tower (Item 61) cable tomo coupler in =AG-X10.

## 2.15 Mount New Cable Support

Dismount cable support (Fig. 11, Item 71) and mount new cable support.

**Attention:** The grooved flexible tube has to mounted to wall stand from the opposite.

Range of movement:  $-70^{\circ}$  -  $+125^{\circ}$  respectively  $-125^{\circ}$  -  $+70^{\circ}$

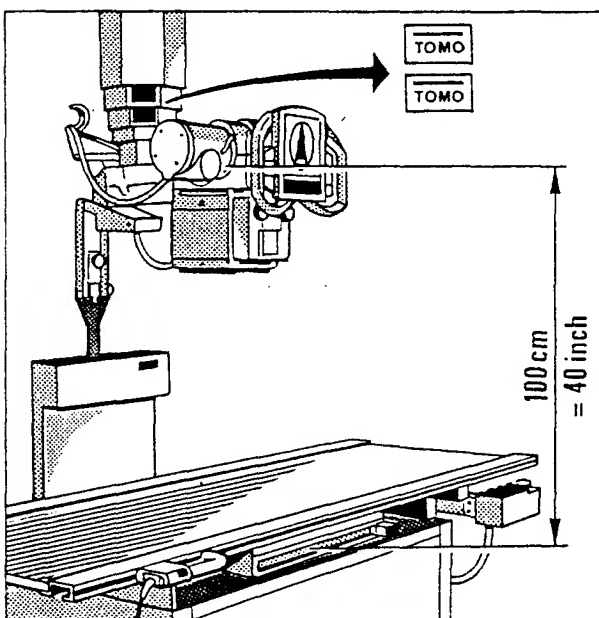


Fig. 16

## 2.16 Installation of Tomo Marks

Bring radiation unit up to 100 cm SID. Mark on telescope with pencil. Move radiation unit some cm to the foot side and install Tomo mark (Fig. 16, Item 80) to telescope column (Item 81).

## 3. Adjustment

### 3.1 Adjustment of Fulcrum to Film Plane

Remove front panel (Fig. 25, Item 73) and rear cover (Item 74).

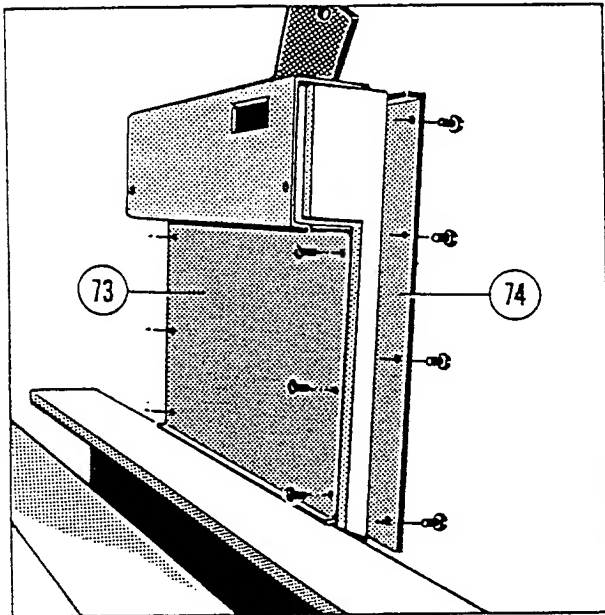


Fig.25

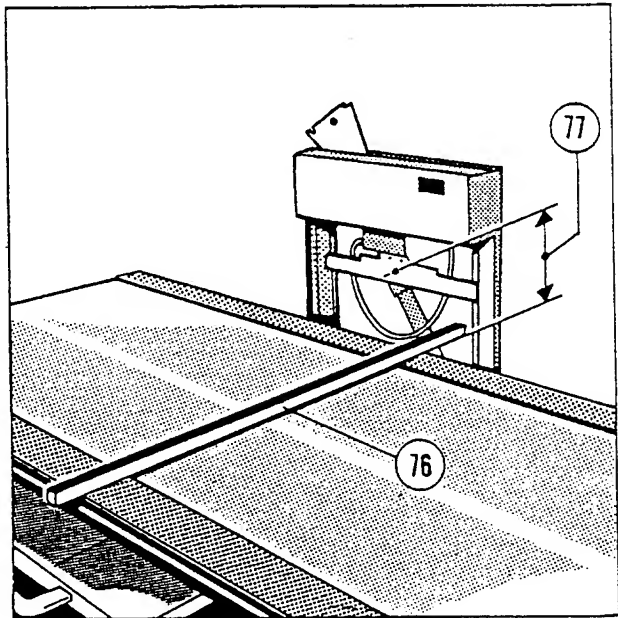


Fig. 26

Place ruler (Fig. 26, Item 76) across profile rails of table top.  
Measure the distance between lower edge of ruler and film plane (Fig. 27, Item 78). Adjust the fulcrum of the coupling bar to the distance measured (Fig. 28).

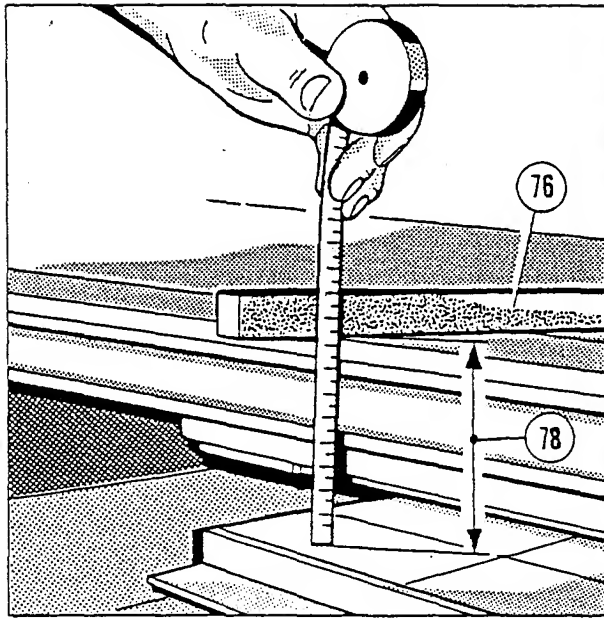


Fig.27

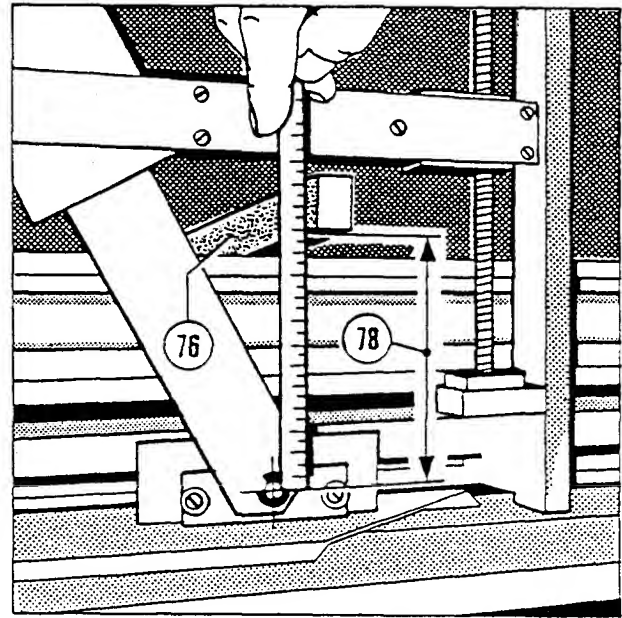


Fig. 28

### 3.2. Setting of Layer Height

Remove front cover (Fig. 25, Item 73 + 75). Place ruler (Fig. 26, Item 76) across profile rails of table top. Push button until layer height is level with table top. The distance between upper table edge and ruler must be equal the distance between ruler and fulcrum (Item 77). Set potentiometer (Fig. 29, Item 84) to "0 cm". Drive layer height to 24 cm distance between fulcrum and upper edge of table top. Set pot (Item 85) to "24 cm".

#### **Note:**

Proper adjustment requires a 10 minute warm-up period. The procedure must be repeated several times, the pots (Fig. 29, Item 84 + 85) are interactive.

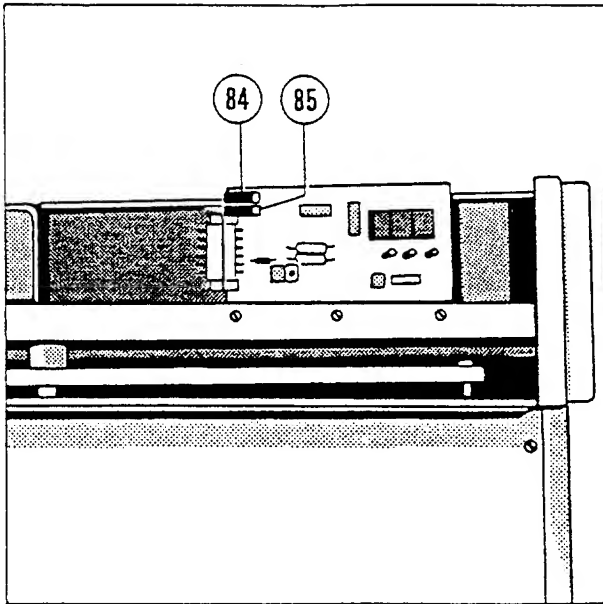


Fig. 29

### 3.3 Timing of Exposure Cycles

Open clamp (Fig. 15, Item 58) to interrupt function of magnetic clutch. Mark the clutch. Push TEST button and count cycles for 60 seconds.

24 cm.p.s 60 r.p.m. at 12 cm layer height, 40° <<, 2,2 sec.  
 12 cm.p.s.30 r.p.m. at 12 cm layer height, 20° < , 2,2 sec.  
 9 cm.p.s.22,5.r.p.m.at 12 cm layer height, Zono 1,2 sec.

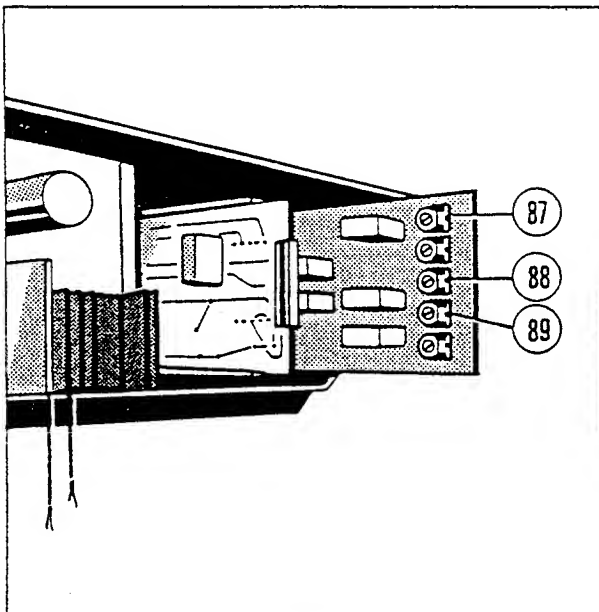


Fig. 30

In case of deviations, adjust with pots:

Fig. 30, Item 87 (R 88) fast speed  
Item 88 (R 90) slow speed  
Item 89 (R 91) Zono speed

### 3.4 Switch flap

Remove cover of TOMO coupling. Actuate solenoid (Fig. 31, Item 91) by hand and move the bucky in coupling position. The switch flap should not touch the edge of the sliding carriage. Adjust, if necessary. Therefore loosen screws (Item 93) and turn lever (Item 94).

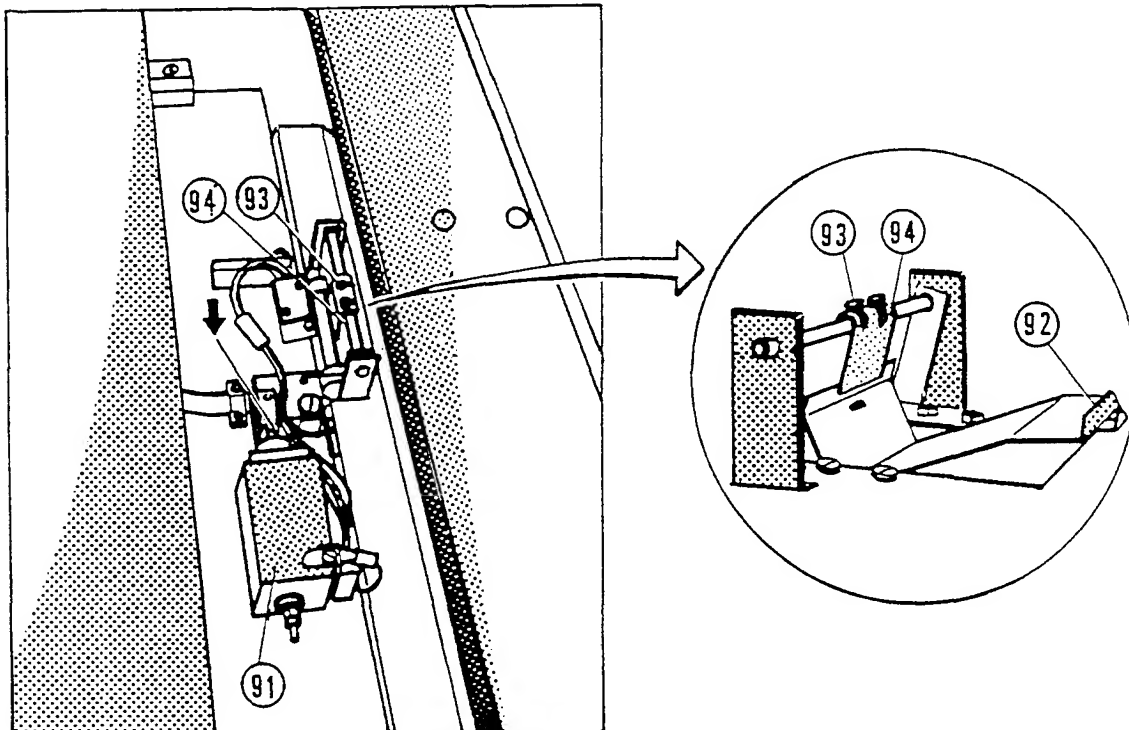


Fig.31

#### 4. TECHNICAL MAINTENANCE

##### 4.1 Mechanical and Electrical Tests

**Note:**

The maintenance schedule described below must be carried out at 12month intervals. If functional tests require power, switch off power immediately afterwards.

Defective parts must be replaced by genuine spare parts acc. to spare parts list.

Use only non-acid grease for maintenance.

Do not grease or oil ball bearings with sealing washers.

**Preperation**

Switch off equipment.

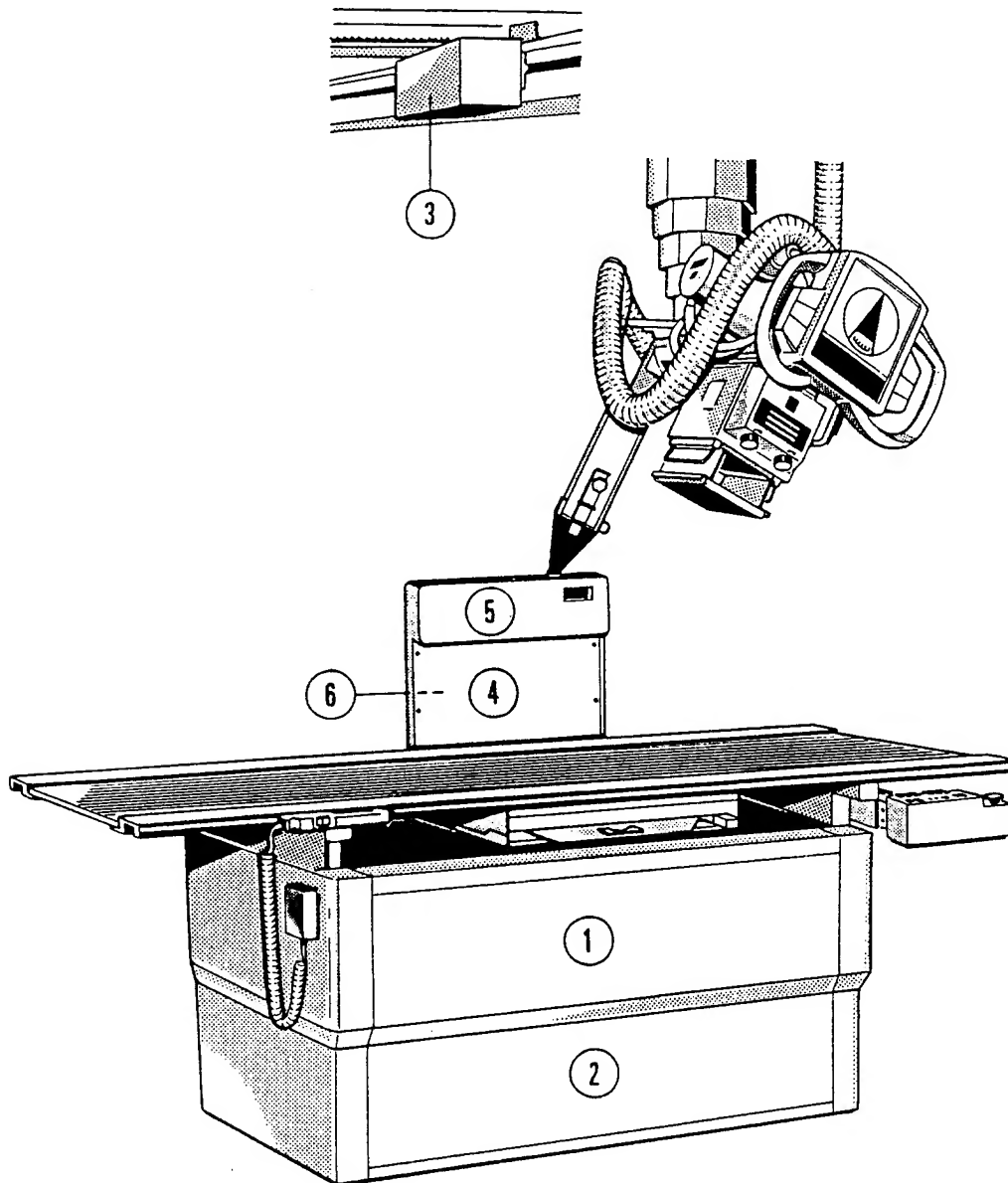


Fig.32

Remove covers (Fig. 32, Item B-F and 73 - 75).

**Tube Coupler:**

- Check screws and tighten, if necessary.
- Check on smooth operation and play.
- Adjust with set screw, if necessary.
- Check compression spring to pull coupler in park position.
- Check magnet to hold coupler in park position.
- Coupling mechanism must have no play.
- Check and replace, if necessary.

**Fulcrum Support:**

- Check and tighten screws, if necessary.
- Limit switches must contact in end positions.
- Check and adjust, if necessary.
- Check spindle drive on play and grease lightly.
- Adjust or replace, if necessary.
- Check belt drive on tension. Adjust if necessary.
- Clean coupling bar carriage (film plane). Lightly grease slide rail and fulcrum.
- Check fulcrum on film plane and adjust, if necessary.
- Check electrical connections and cables on damage. Replace, if necessary.

**Digital Display:**

- Layer height must coincide with height indicated. If necessary, readjust acc. 3.2.

**Tomo Coupler:**

- Check and tighten screws, if necessary.
- Operate magnet by hand and couple flap with bar carriage. Flap must not be too high and should couple without play. Check and readjust, if necessary.
- Check microswitch actuation.

**Electrical Unit:**

- Check electrical connections and cables on damage. Replace, if necessary.
- Check and tighten mechanical fastening devices, if necessary.
- Check all parts on firmness. Tighten, if necessary.

**Control Box:**

- Check and tighten mechanical fastening to table frame, if necessary.
- Check friction of swing and readjust, if necessary.
- Check functioning of all controls and buttons.



## **4.2. Functional Tests**

### **Tube Coupler:**

- Folding up and down smoothly? Without play?
- Remaining in park position accurately? (Recuperating spring, magnet)
- Locking the coupling bar without play?

### **Fulcrum Support:**

- Layer height drive running without noise?
- Coupling bar remaining in center position accurately?

### **Digital Display:**

- Display correct?
- No indication jumps?

### **Tomo Coupler:**

- Coupling without play?
- Not bumping against sledge edges?

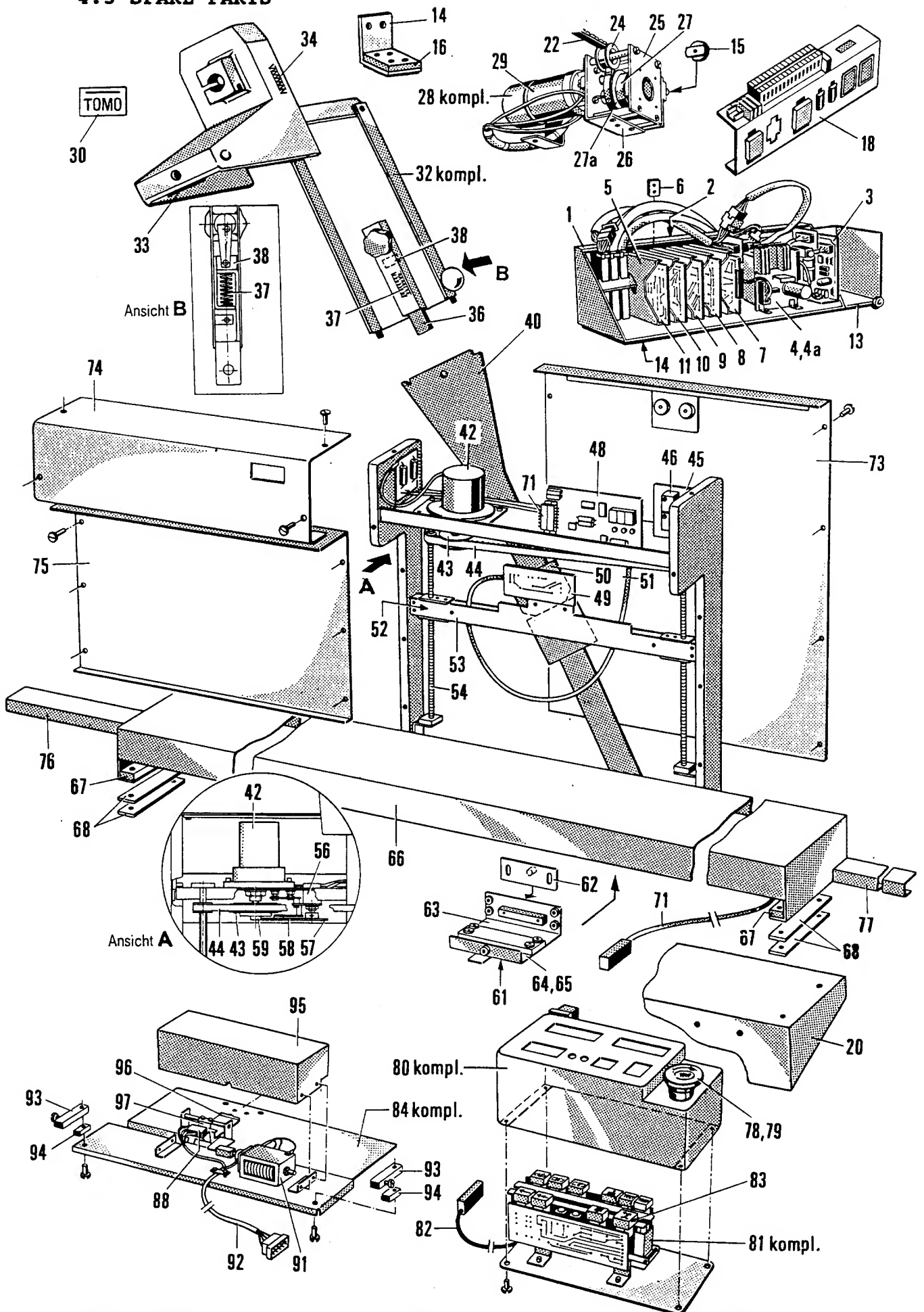
### **Electrical Unit:**

- All electrical cables without damage?
- All connections correct and tight?

### **Control Box:**

- Swing having friction in any position?
- All buttons switching accurately?

### 4.3 SPARE PARTS



#### 4.3.1 SPARE PARTS LIST

##### Part Names / Ordering Numbers

Failed spare parts may be replaced only with original parts as listed below. When ordering spare parts always indicate serial number of unit and complete number of part. The exchange of parts or elements may only be carried out by ourselves or by qualified personnel being authorized to do so. See also chapter: "Safety Notes".

REF.No.	Name	Part No.
1	Frame	0322 0910
2	Harness	0322 1070
3	Transformer	0622 0651
4	Control	0006 0248a
4a	P.C. Board, variable	0006 0248b
5	Frame	0006 0213
6	Supporting part	0006 0214a
7	Circuit board	0322 0869
8	Circuit board	0322 0866
9	Circuit board	0322 0867
10	Circuit board	0322 0868
11	Amplifying board	0322 0865
12		
13	Drawer guide	0005 0158f
14	Angle	0323 0335
15	Nut for T-notch	0323 0654
16	Belt clamp plate	0323 0663
17		
18	Tomo-interface	0323 0706
19		
20	Bracket	0323 0682
21		
22	Belt	0660 0877
23		
24	Return pulley	0323 0648
25	Bracket	0323 0651
26	Mounting bracket	0323 0644
27	Coupling	0006 0478
27a	Gear wheel	0322 0754a
28	Drive system	0323 0642
29	Motor	0006 0195a
30	Tomo mark	0322 0786
31		
32	Tube coupler complete	0323 0590
33	Magnet	0005 0094
34	Compression spring	0005 0040a
35		
36	Bolt	0322 0733
37	Compression spring	0005 0042p
38	Strap	0322 0736
39		
40	Coupling bar	0322 0627

REF.	No. Name	Part No.
41		
42	Gearmotor	0322 0528
43	Toothed belt wheel	0322 0530
44	Toothed belt	0005 0116
45	Switching bar	0322 0586
46	Switch	0006 0079a
47		
48	Circuit board	0322 0952
49	Switch	0322 0875
50	Reflector (on - off)	0322 0588a
51	Reflector (on)	0322 0588b
52	Acme thread nut	0322 0526
53	Bridge	0322 0534
54	Lifting spindle	0322 0522
55		
56	10-speed potentiometer	0006 0251a
57	Gear	0322 0971
58	Gear	0322 0968
59	Pinion	0322 0960
60		
61	Switch	0322 0569
62	Driver	0322 0572
63	Carriage complete	0322 0558
64	Catch	0322 0566
65	Spring	0322 0567
66	Bridge	0322 0608
67	Clamp	0322 0616
68	Spacer	0322 0615
69		
70		
71	Cable	0323 0435
72		
73	Rear cover	0323 0318
74	Top cover	0323 0320
75	Front cover	0323 0317
76		
77		
78	Dry rot key	0006 0260
79	Switch element	0322 0816
80	Control part complete	0323 0444
81	Switch board	0322 0909
82	Cable	0323 0453
83	Bulb	3360 0001
84	Bucky tomo coupler	0323 0580
85		
86		
87	Switch	0006 0079a
88		
89		
90		
91	Solenoid	0006 0245
92	Cable	0323 0582
93	Extension	0322 0674
94		
95	Magnet cover	0322 0672
96	Coupling plate	0322 0642
97		

